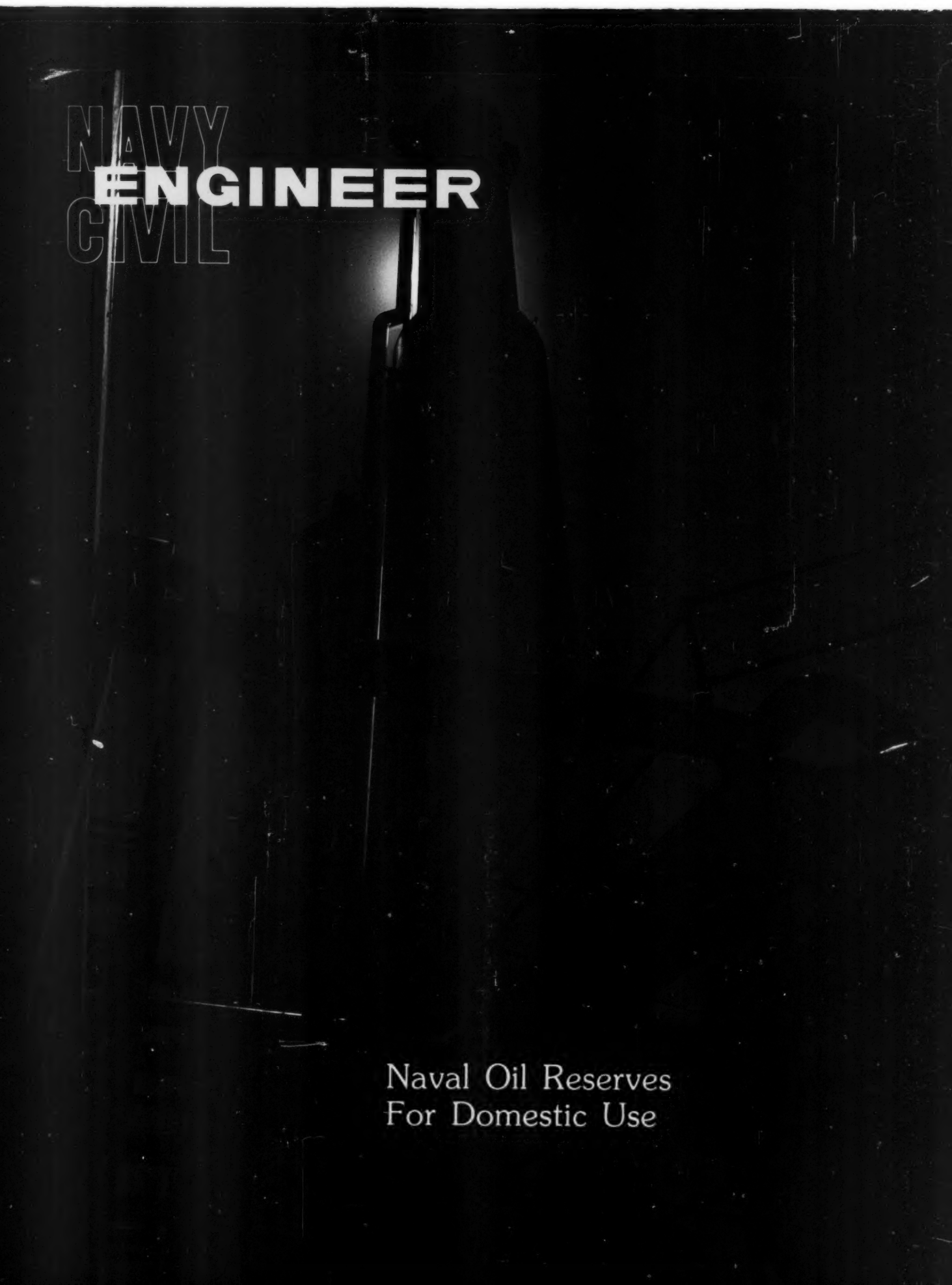
NAVY
CIVIL
ENGINEER
Naval Oil Reserves
For Domestic Use

ON THE COVER

The historic Naval Petroleum Reserves of Elk Hills, California, now administered by the U. S. Department of Energy, have become the nation's third largest domestic production field with the new processing units contracted by Naval Facilities Engineering Command.

Introducing the new young professionals of the U.S. Navy

Civil Engineer Corps

CECOS Basic Course No. 150: Front row from left —Ens Scott Sisson (Univ. of Cincinnati) to Corpus Christi, Tex.; Ltjg Louis Marchette (Univ. of S.C.) to Pensacola, Fla.; Ens Alvin Grimmig (Univ. of Wash.) to Gulfport, Miss.; Ens Mary Kappus (MIT) to Guam; Lt Dean Vidal (USNA) to Port Hueneme, Calif.; Ltjg Michael Mauk (Purdue U.) to Charleston, S.C.; Ens Daniel Hunt (USNA) to Jacksonville, Fla.; Ens Mark Schoeppner (Ohio State) to San Diego, Calif.; and Ltjg Paul Brown (USNA) to New Orleans, La. **Back row**—Ens David Vacek (Northwestern U.) to Port Hueneme, Calif.; Ens Terry Classen (Notre Dame) to Iwakuni, Japan; Ens Mark Gemender (Mich. State) to La Maddalena, Italy; Ens Jerome Sampey (Southern U. & A&M C.) to Monterey, Calif.; and Ens James Walter (Cornell) to New London, Conn.

CECOS Basic Course No. 151: Front row from left—Ens Charles Dale to Gulfport, Miss.; CWO2 Robert Dupalo (Univ. of Maryland) to Diego Garcia, Indian Ocean; CWO2 David Thomas to Port Hueneme, Calif.; CWO2 John Dickenson (La Verne U.) to Adak, Alaska; Ens Margaret White (Univ. of Washington) to Camp Pendleton, Calif.; Lt. John Kucinski (USNA) to San Diego, Calif.; Ens Thomas McNutt (Univ. of Nebraska) to South Weymouth, Mass.; Ens Kenneth Moncayo (USMA) to Washington, D.C.; Ens Robert Barron (Univ. of Texas) to Antarctica; Ens Lee Kersh (Univ. of Oregon) to Portsmouth, Va.; and Ens Perry Laboone (Univ. of Florida) to Great Lakes, Ill. **Back row**—Ens Darrell Van Hutten (USNA) to Port Hueneme, Calif.; CWO2 Gerald Rominger (La Verne U.) to San Diego, Calif.; Ens Carl Raney (Univ. of Louisville) to Orlando, Fla.; CWO2 Richard Scott to Marietta, Ga.; CWO2 Dale Britt to Gulfport, Miss.; Ens Larry Elkins (Univ. of W.V.) to Pearl Harbor, Hawaii; Ens Barry Smith (USNA) to Patuxent River, Md.; Ens Craig Bowles (Univ. of Maryland) to Dam Neck, Va.; Ens Robert Citrano (VPI) to Norfolk, Va.; Ens Quentin Bruhn (Univ. of Oregon) to Mare Island, Calif.; and Cpt Nirundon Patpongpanit (Milwaukee School of Engr.), Royal Thai Army.

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OIL PUMPING into the nation's fuel market is a result of a multimillion development of the Naval Petroleum Reserves at Elk Hills, Calif. See page 3.

Maintenance Service Contracting—

friend or foe?

IT'S A FACT OF LIFE, that of maintenance service contracts. An interesting view from a field user is related in detail on page 20.

JUNE 6, 1979 observed the 35th anniversary of D-Day in Europe, where an American cemetery permanently honors the event. The experiences of the Navy Seabees on the original date will be told in the next edition.

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Photographs by **PH2 DAVE FRAKER**

Elk Hills!

vast new oil resources opened at Naval Petroleum Reserve

By
CDR GORDON R. GILMORE, CEC, USN

Officer-In-Charge of Construction
Elk Hills Naval Petroleum Reserve
P.E., Va.

THE BIG PICTURE OF Elk Hills reflects the sometimes feverish construction effort to complete new processing facilities for the Department of Energy by the Naval Facilities Engineering Command and its staff of Civil Engineer Corps officers. Located in California's San Joaquin Valley near Bakersfield, the historic Naval Petroleum Reserves, now administered by the U.S. Department of Energy, is furnishing additional oil and gas products for domestic needs.

In 1976 Congress passed the Naval Petroleum Reserves Production Act, which mandated that the Navy bring the production of each Reserve to its maximum efficient rate with the oil to be sold commercially through competitive bids.

Today Elk Hills is the third largest producing field in the country just behind Prudhoe Bay in Alaska and the East Texas field. It is probably the most active field in terms of construction, well drilling and other associated development.

The Reserves, now administered by the U.S. Department of Energy, have been extensively developed in recent years with additional processing, storage and distribution systems whose construction has been supervised by the Naval Facilities Engineering Command and the Navy's Civil Engineer Corps.

A first look at Elk Hills is not particularly inspiring. Ultramarine walking beams with yellow "horse heads," form the pumping units for the shallow wells and supply what little color there is to the barren hills. In the distance, a drilling rig towers over the landscape. Roads snake around and over the hills — some are paved, while others remain gravel or sand. The surfaced roads were built originally by the Seabees during World War II. They aimed their bulldozers at the hills, scraped a ribbon out of the sand, rolled a bit, laid some asphalt, and that became the road network used to this day. Over 33 miles of paved and secondary roads were completed before the Seabees were transferred to the urgent needs of the Pacific Theater of war.

A county highway bisects the Reserve from south to north. Near this road between the flat desert and gently sloping hills is the newly constructed crude oil tank farm. Five 10.5 million-gallon tanks wait for crude oil storage. The total capacity is 1.25 million *barrels* of crude. The tanks are 210 feet in diameter and 40 feet high. They have floating roofs with double seals to retain gaseous vapors and avoid degradation of the environment. This is probably one of the largest tank farms ever built under NAVFAC supervision. A short distance from the tank farm are 12 smaller tanks used for separation of oil, water and other foreign material prior to delivering the oil to commercial buyers.

Passing the tank farm and climbing to the top of a slight rise, tall silver towers gradually grow out of the desert. These are the fractionating columns for the existing gas processing plant which was constructed in 1951 but not placed into operation until 1976. The plant is now processing an average of 94 million cubic feet of gas per day (MMCFD) at full capacity. Behind the plant is a liquid storage facility

where the butane, propane and liquid natural gasoline, extracted from the gas as it travels through the plant, is stored and delivered to buyers.

Adjacent are two new gas processing plants under construction, each with a capacity of 100 MMCFD. Included in the construction NAVFAC is building another liquid products storage facility and a truck loading facility. These new gas processing plants are low temperature separation types where the temperature of the gas is reduced to about –10°F to enhance extraction of the butane, propane, etc. The recovery efficiency of products will be much better than that experienced in the existing plant which uses an absorption process.

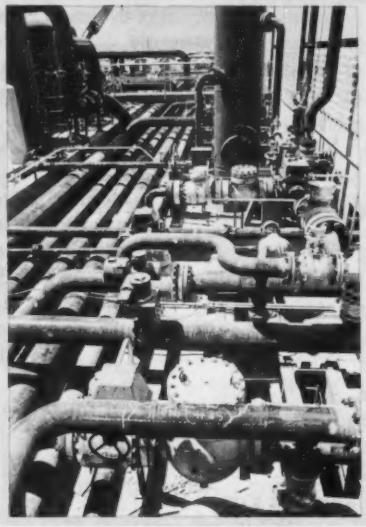
Between the new plants and the existing one is a recently completed high pressure injection facility with three gas-fueled, 5500 hp compressors. As the gas leaves the processing plants, its pressure is increased to about 3500 pounds and it is then transferred through gas lines to wells where it is injected into the oil reservoir gas cap for pressure maintenance. Currently, the major producing reservoirs at the Reserve have enough pressure for the oil to flow to the surface. However, as oil is produced this pressure is reduced. The gas is reinjected to maintain pressure and keep the wells flowing as long and as efficiently as possible.

The high pressure injection facility was an urgent project required for an immediate increase in oil production. Erection of the plant began in early July 1978 and around-the-clock construction operations resulted in completion in November 1978.

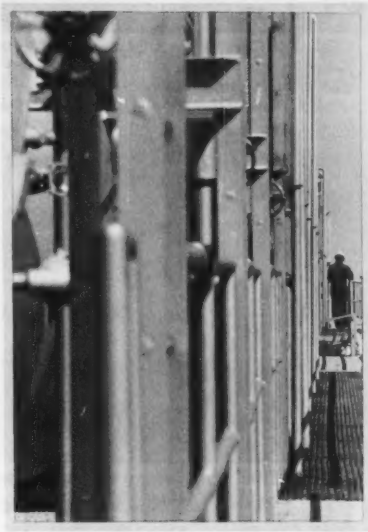
The gas that is being processed and then reinjected is called associated gas because, rather than coming from actual gas wells, it comes to the surface with the oil. At the surface, the oil and gas are separated with the gas going to the plants for processing and the oil transferred to small field tanks and then to the larger settling tanks prior to sale.

The oil comes primarily from the Shallow Zone at 3,000-4,000 ft. drilled depth and the Stevens Zone from 5,000-9,000 ft. drilled depth. Over 43 million barrels have been sold during the past year, two-thirds of which came from the Stevens

PRODUCTION SCENE — Impressive industrial silhouette reflects production capabilities at Elk Hills. This is an original gas processing plant brought up to current technology with clear steam as its only waste product.

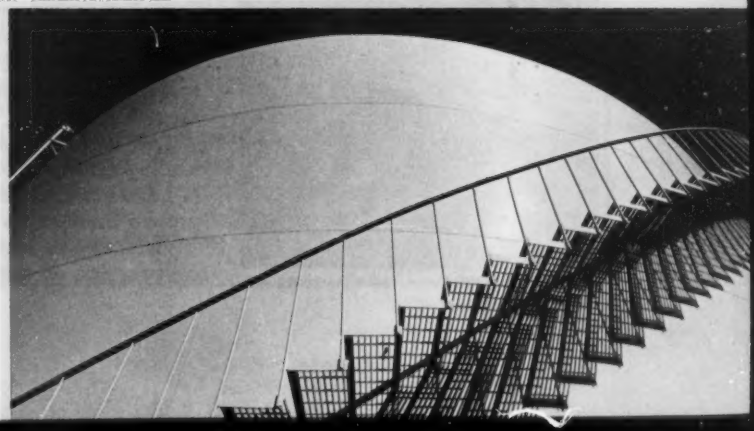


INTRICACY of petroleum plants requires painstaking design. Elk Hills development, however, has been completed in record time by prime contractor. (Note workman, right center.)



LNG-Liquified Natural Gas — another product of Elk Hills is retained in pressurized storage tanks. Around-the-clock pressure is maintained by frequent inspection.

DRAMATIC photograph of one of the newly constructed oil storage tanks, which are among the largest ever constructed under NAVFAC supervision.



Elk Hills!

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SUPERVISOR stands on lowered top of tank within storage basin

CEC OFFICER of the Officer-in-Charge of Construction staff reflects on completed gas compression facility.

SERPENTINE pipelines crawl over barren landscape of the nation's third largest petroleum field.

DISCOVERY WELL — the first of its kind at Elk Hills

Zone. Recoverable oil is estimated at 1.2 billion barrels with over a trillion cubic feet of recoverable gas.

There are other producible zones, one of which is particularly interesting. The Carneros Zone is found between 9,000-10,000 feet drilled depth and while not as prolific as the Shallow or Stevens Zones, it produces a gas condensate which is so light it could almost be burned directly in an automobile as it comes from the ground. In the old days, before high performance cars, it *was* used directly for fuel by some oil field workers.

Since the majority of the oil produced flows to the surface its production expense is minimal. The Elk Hills crude oil contains very little sulfur and is of high quality. It is an excellent crude for refining, with Shallow Zone crude noted for its lubricating oil content and the Stevens crude noted for its high gasoline content.

"The objective is to get the oil out and a side benefit is the extraction and sale of the liquid products encompassing butane, propane and liquid natural gasoline," explains LCDR Jerry Newton, CEC, USN, project engineer. "With additional gases scheduled for processing as the new plants become operational, there will be a tremendous quantity of liquid products to handle. Design is underway on a rail-loading facility east of the community of Taft, south of the Reserve. The products will be transferred by pipeline, then loaded in rail cars for transfer to market areas."

The land proposed for the rail loading facility belongs to the Bureau of Land Management (BLM). At the present time an environmental study is underway to assess the impact of construction on the surrounding environment and to develop any mitigating measures necessary.

The present wave of construction is progressing at a rapid pace with shift and overtime work utilized when needed to meet critical schedules. The program is estimated to cost about $600,000,000 and is almost evenly split between NAVFAC and Williams Brothers Engineering Company, the current operator/contractor for the Reserve, which, by the way, is currently administered by the Department of Energy (DOE). The DOE has about 60 civil service employees and eight naval officers managing the Reserve. Chevron USA owns about 20 percent of the Reserve and participates in its management through a unitization agreement with the Government.

It is interesting to note that during World War II, women comprised about half of the work force. Their job was like their male counterparts to keep the machinery running and the field producing around the clock.

At all hours of the day they drove their trucks over lonely, muddy roads, in rainy weather and through fog-ridden nights to ensure that production was maintained.

In 1973 when the initial oil embargo rocked the country, Elk Hills was only partially developed and basically in a caretaker status under the watchful eye of the Congress. In a short six years, oil production has increased from below 5,000 BOPD to over 160,000 BOPD and the facilities are being constructed to enable a production rate of over 200,000 BOPD in 1980. This Reserve is playing a vital role in offsetting the growing energy supply problem. Our future will depend on using our energy resources wisely while alternate sources of supply are being developed. □

Standards and codes may not lead to

Facility Safety Design

By GARY T. STAFFO
Safety Office,
NAVFAC HQ
● Alexandria, Va.

Over the years, facilities design safety has been based upon the development of codes and standards establishing minimum safety requirements. In general, these standards and codes are a good place for the designer, architect or engineer to begin gathering relevant safety information. However, to use these standards and codes effectively it is important that their problems and limitations be understood. This article highlights some of these problems so that designers, architects or engineers may avoid these pitfalls which may result in design deficiencies.

Standards and codes historically have been developed in response to specific deficiencies as they developed. Thus, to a great extent, codes and standards are dated, in that they mainly address problems of the past. There are many instances that developments in materials, changes in techniques, and advances in technology are not recognized. In the area of fire protection, for example, the change from the wood cellulose to the plastic synthetic environment created a number of hazardous problems which showed the inherent weaknesses of relying on codes and standards for facilities safety.

The testing for "flame spread, fuel contributed and smoke developed" was based upon tests designed for the *wood cellulose* environment. These same tests were used for testing *plastic synthetic* materials and in many cases were completely erroneous for real-world fire situations. For instance, some plastics rated as low flame spread by test procedures actually produced intense fires in real-world fire situations.

Also highlighted was the misconception many designers held concerning the concept of "2-hour", "4-hour", etc., rated firewalls. The rating for these designs was based on the standard time-temperature curve which is derived from the energy give-off by the burning of cellulose family materials. Plastic synthetics, when burned, in most cases do not fall under the standard time-temperature curve. Many plastics are quick burning, high energy release materials which produce drastically more intense fire conditions than contemplated by the standard time-temperature curve. The outcome of this is that the so-called "2-hour" rated wall really may last only 30 minutes when exposed to these high-energy plastic fueled fire situations.

Thus, buildings designed using standards based upon the wood-cellulose environment may be inherently hazardous due to plastic synthetic fire loading which the standards failed to address.

Another problem is that the applicability of codes and standards varies. The use of some are mandatory, whereas use of others is voluntary, or in some cases even a combination of both. For example, many standards, especially those of the American National Standards Institute (ANSI) and the National Fire Protection Association (NFPA) which are voluntary "national consensus" standards, were, with minor changes, published as mandatory standards by the Occupational Safety and Health Administration (OSHA). The enforcement of the Occupational Safety and Health Act brought attention to the fact that although private industry had developed these minimum safety standards, many companies were not complying with them. The variations that normally prevail in application of codes and standards, coupled with the fact that the majority of them are only *minimum* requirements, leads one to seriously consider the effective level of safety they are providing the facility and its occupants. Further, there are many hazardous areas for which standards and codes do not exist.

Problems often are presented by the manner in which the codes and standards are written. There are many instances where requirements are related in imprecise or unclear items; thus, they are subject to more than one interpretation. Similarly, generalized phrases like "adequate distance" or "sufficient clearance" often are used, requiring interpretation and subjective judgment. In some cases a standard consists of a confusing mixture of mandatory and optional requirements; or there may be optional requirements that should be mandatory, and mandatory requirements that should be optional. Further confusion exists when codes contain a clause (e.g., "the authority having jurisdiction") which delegates authority and responsibility for interpretation of the code or standard to another party, providing too much latitude in deciding applicable requirements in many cases.

A major problem has been the lack of a systematic evaluation of codes and standards to insure harmony among them and assess their total contribution to the overall goal of safety. The absence of a single uniform body to determine where duplication, inconsistency, or

(continued next page)

Facility safety design . . . . .

(continued from preceding page)

lack of coverage in critical areas affecting safety exists, contributes to this problem.

The current debate between the pro's and con's of "performance" versus "specification" standards is another problem attracting major attention. Codes and standards generally are written and used in terms of "specification" requirements (e.g., specific, rigid, detailed, "how to" requirements) rather than "performance" criteria which allows flexibility in the manner and approach to meeting the intent of the standard.

The end result under "performance" criteria often exceeds the required operational/functional use at reduced cost. The present system of using "specification" standards encourages blind compliance with those standards. This instills a false sense of confidence because standards compliance in itself does not assure a hazard free environment.

The use of "specification" standards inhibits or stifles originality and creativity in addressing hazard identification and correction. Codes and standards, if developed under "performance" criteria, would present designers with a challenging and hopefully productive task which would bring about new advances in the art of designing a safe and healthful facility. It would provide flexibility for the designer, architect or engineer to tailor his work to the specific task (which, by nature, are varied and continually changing) while maintaining the intent of equal or better protection. This flexibility, based upon the intent of codes and standards, would accelerate the use of new technology to solve safety design problems at reduced cost.

The General Services Administration's "Goal Oriented Systems Approach to Fire Safety in Buildings" is an example where "performance" criteria coupled with the systems approach was used to incorporate fire protection engineering features into the heart of the building design process. This resulted in a cost savings not only in fire protection but also in building maintenance, security and construction costs. There is a trend toward "performance" rather than "specification" standards. Hopefully, this will continue, as it provides the required flexibility in facilities design safety.

The codes and standards approach to safety, because of the problems discussed above, has many gaps and shortcomings which must be overcome to have an effective level of safety for the facility and its occupants. Therefore, the designer, architect or engineer must be aware of these limitations and develop the capability to overcome them. Effective use of standards requires that the individual acquire a working knowledge of the intent behind the standards provisions and apply this knowledge creatively in the process of providing safety in the project.

Thus, the skill and expertise of the individual can best be shown by his creative ability to provide equal or better protection as intended by the standard in a manner which optimizes performance and cost tradeoffs. □

San Diego PWC leads in energy economy

● San Diego, Calif.

A Superior Achievement Award for Energy Conservation during 1973-1977 has been awarded the Navy Public Works Center, San Diego, during a recent ceremony at the Center.

Rear Admiral D. G. Iselin, Commander of the Naval Facilities Engineering Command, presented the certificate on behalf of the Secretary of the Navy to Captain R. J. Westberg, PWC Commanding Officer.

During the ceremony, RADM Iselin praised the "impressive" energy conservation efforts of the Center. "It's obvious that PWC San Diego has a continuing, aggressive and well-planned energy conservation program," he said.

The Certificate of Superior Achievement reads, in part, "Through development and execution of sound energy management programs, energy consumption was reduced significantly without adversely affecting readiness.

"Highly innovated approaches to energy conservation as well as effective training and public affairs programs produced energy-efficient operations.

"This noteworthy reduction in energy consumption contributes significantly to the Navy Department's Energy Conservation Program and establishes an example for other commands and activities to follow in helping the Nation conserve critical energy resources." □

National Defense —

by the willing or by the unwilling?

By T. C. MURPHY
Professor Emeritus
CECOS

I read a newspaper account in January of a speech by an elected representative which put me into a proper fantod — a state I don't care to be put into at all. Maybe it was just another bit of political rhetoric or maybe I'm getting to be picky. The best that can be said of his statements is that they are examples of very tortured reasoning; the worst that can be said — well, judge for yourself.

His remarks had to do, in part, with restoration of the draft, and after a ritual derogation of the AVF he got to the real issue: money. He pointed out that we currently allocate 53% of the defense budget to personnel costs while the Soviet military personnel costs amount to only 25% of their defense budget. The implication was that return to a draft military would bring our personnel costs nearer to the Soviet model. (And save lots of money in the bargain? It will not.)

It is possible, of course, to make all sorts of equivocal US–USSR comparisons.

For instance, the legislative branch of the Soviet government does its work by meeting for two weeks every two years. In the same amount of time, it takes Congress 14 months to do its work.

And I wonder: How does the salary of a member of the Supreme Soviet compare with that of a U.S. Congressman?

Soviet legislative costs are nominal, of course. By comparison, the cost of Congress is enormous.

Such comparisons are quite meaningless; apples and oranges, etc.

But what bothers me most, about his comparison of personnel costs, is that it will comfort and encourage those in this country who believe that we should strive to emulate the Soviets — wholesale. And there are a few who work very hard, every day, to bring it about.

Further, most Americans are not attracted to a Soviet model of anything—quite the opposite. For instance, a reader of the original statement, in a letter to the newspaper which carried the account, wrote:

"I find it disgusting that he resorts to comparing a country of people owned by the state to our state owned by the people. Labor is always cheap at the point of a gun."

The Soviet value scale has always put things ahead of people. That's *their* heritage. Ours is different.

And then he sagely repeated the oldest chestnut in the draft-bloc idiom: we spend so much on people that there isn't enough money left over for weapons and equipment. (This is what can be called the "make-do" scam which is laid on us annually at budget time.)

He is telling us that the congress is dictated to — and stands helpless before — the executive branch of the government. Whatever happened to our "checks and balances?"

A president can't have his way, for example, without congressional "permission" — that is when Congress votes to sustain a veto of a bill. Congress doesn't *have* to do that — as the speaker knew. His statements misrepresent the truth.

I resent the presumption behind his statements — the presumption that the listener or reader is stupid.

But then he said (in reference to involuntary soldiers — a draft army) an army of unwilling soldiers is a good safeguard for the country!

And, he coupled that statement with this: "people who serve reluctantly in the military service forever distrust generals and admirals."

This is a benefit?

First of all, I've seen willing soldiers and I've seen unwilling soldiers and for some reason I feel a lot better with the willing ones. They sure looked and acted like a better safeguard to me.

And I know of a lot of people who learned to forever distrust generals and admirals — especially American generals and admirals — beginning with George III and including Hitler, Mussolini and Tojo.

One doesn't have to be an unwilling soldier to develop that distrust. One could arrive at that point if he were an educational deferment, or a draft-dodger, or even a member of Congress. But there *is* one big difference: they don't have to serve unwillingly.

The truth is that most Americans prefer to respect and trust generals and admirals because they have done well the things that our civilian leaders have wanted done over the past 203 years. We may need them again.

Suddenly and sorely.

Distrust breeds distrust, and it is my opinion that anyone who would cultivate it, does so without any constructive intent. Haven't we had enough of it? The scabs of Vietnam and Watergate haven't fallen off yet. Trust is the bonding agent that holds a society together; there are many examples today of disintegrating societies—cultures which have cultivated distrust to the point where decomposition has set in.

I admit that the speaker's statements may have been reported out of context, but it is very difficult to imagine how any text could ameliorate the sense (or non-sense) of his words about unwilling soldiers and the benefits of the distrust they learn.

Men who labor in the political minefields should know about language and how their words may be interpreted. Flights of ecto-wisdom are unconvincing at best, unintelligible at their worst.

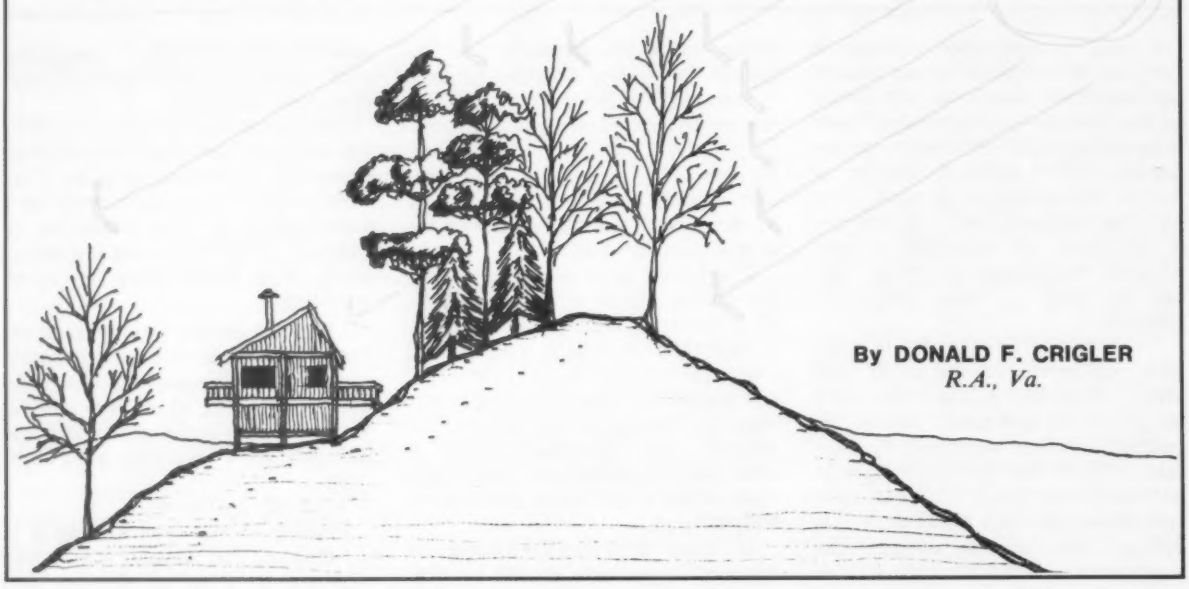
Some of us might learn to distrust persons who publicly speak like that. Judging from the meager turnout for the election last November, some people already have.

Two-thirds of the electorate were AWOL on election day!

And that's a bad thing, too.

□

Energy Responsive Architecture



By DONALD F. CRIGLER
R.A., Va.

● Alexandria, Va.

Prices at gas pumps continue to rise—and every electric bill is a reminder that the age of inexpensive energy has ended. The earth's 'savings account' of fossil fuels has peaked and now is headed downhill. These factors stress the necessity for a major change in thinking for the design profession, in particular, that of the architect.

The architect, as the major designer and coordinator of new buildings, has the greatest potential to produce significant energy savings. Savings of 50% and more can be achieved when the architect considers energy economics at the beginning of the design process. Energy savings achieved by architectural design and detailing are the most effective way to conserve energy. The majority of these savings can be accomplished at little or no increase in the initial construction cost.

In the past, architects didn't consider energy as a design parameter because it was relatively cheap. Rising fuel costs are pushing energy economics to the top priority in the architects' design process. Good energy responsive architecture is a complex interaction of climatic and architectural relationships and should be designed to work together harmoniously.

Climatic Relationships

The first step an architect experiences in the design process is environmental analysis. This portion identifies climatic and site parameters that should be primarily considered. The climate, or macroclimate, at a given site consists of essentially three elements; the sun, the wind and the temperature. A good macroclimatic analysis should identify and document the sun's location in the sky during the year, and quantify the amount of solar radiation striking the earth, in langleys or BTU/sq.ft. Solar information is used to determine the site placement, orientation, and detailing of the building envelope.

The man-made environment tends to have a detrimental effect on the climate rather than a moderating one as it produces shade and blocks the sun regardless of the season. It also absorbs solar energy and, in conjunction with the waste heat of cars, air conditioners and other appliances, elevates the ambient air temperature year round. Inner cities also produce higher velocity wind currents, due to funneling between tall buildings, and therefore increase infiltration.

The architect must understand the different climatic and site interactions to achieve a well balanced approach to an energy efficient design. The next step in design is to understand the interface of climatic and architectural relationships.

Prevailing winds produce infiltration at the joints of windows and doors. Information on prevailing wind speed and direction aid the architect in planning a structure which minimizes openings on the side facing the prevailing winter winds. This information also provides clues in siting a building to take advantage of natural wind shelters such as hills or vegetation, on, or adjacent to a site. Temperature information identifies the most critical season, either winter or summer, that the architect should design for.

The climatic parameters, previously identified, can be modified, or

changed significantly, by the characteristics of an individual site. This is why a macroclimatic analysis is necessary. The four major site characteristics that have the potential to alter the general climatic information are; the terrain, water, vegetation, and the man-made environment.

The terrain can produce undesirable shading or it can enhance the solar exposure of a structure depending on the degree and direction a slope faces. Natural land forms can increase wind velocity or they can act as a wind break. The terrain also affects night air temperatures. Slope zones are warmer than the surrounding valleys and plateaus since the cold night air flows down into the valleys and settles on plateaus.

Water bodies produce higher atmospheric humidity levels due to evaporation. Clouds also reduce the amount of sunlight that reaches the earth. Large water bodies, such as bays or the Great Lakes, produce land sea breezes which must be considered during site planning and design. Land sea breezes tend to moderate the temperature of coastal regions due to the mixing effect. This effect in conjunction with nocturnal cold air flows can produce temperature differences of as much a 34° between two areas separated by only 7 miles distance.

Vegetation can produce modifications to the three climatic elements also. Summer shading, winter wind breaks, and moderate ambient air temperatures can all be achieved with the proper use of vegetation.

Architectural Relationships

The two major areas that present an opportunity to save energy in the schematic design phase are in the space planning and the envelope design. At the beginning of a design, the architect should orient a structure as close as possible to the optimum for that particular climate zone and site. The configuration, or shape, a building takes influences the energy consumption too. Generally, buildings with the long sides facing north and south with a majority of glass on the south side, perform best. The envelope to volume ratio is another factor which affects energy consumption. The smaller the building, the more critical the envelope to volume ratio is. This ratio is a function of the extremity of the climate

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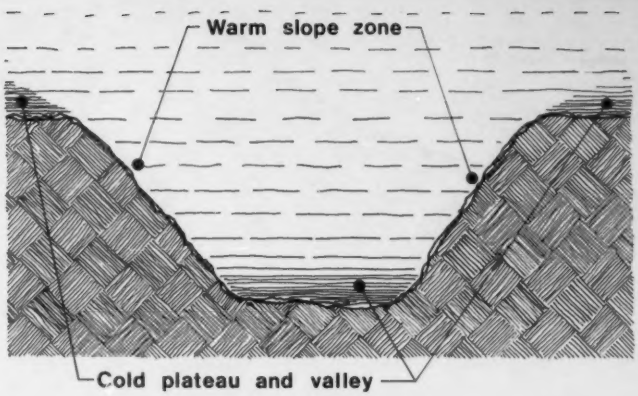
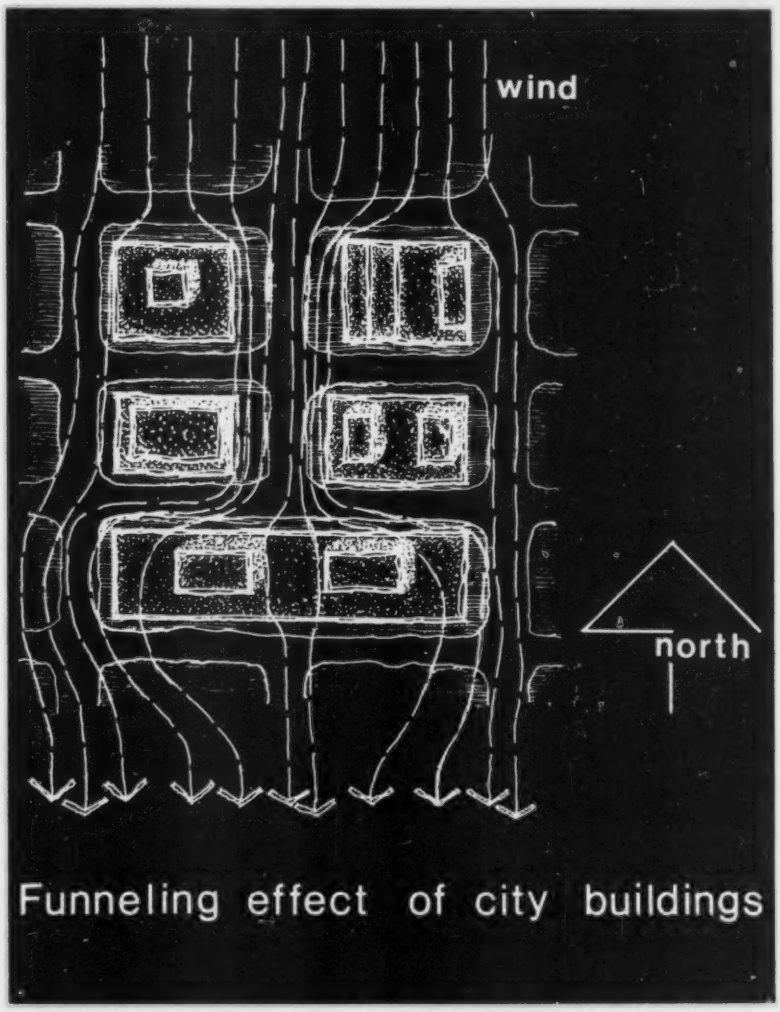
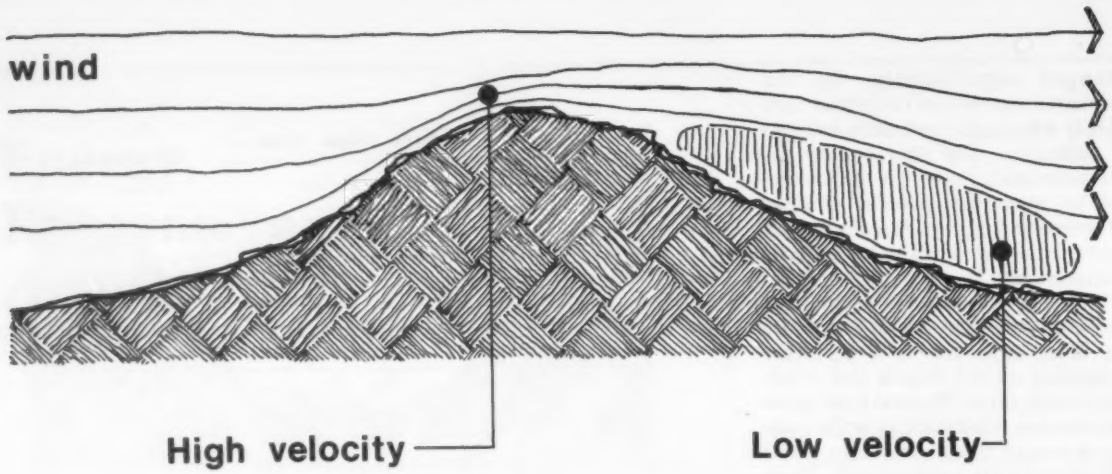


Night air temperature distribution



Funneling effect of city buildings



Section at a hill

The impact of terrain on wind

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for a given location. As the climate becomes more extreme (locations where heating or cooling is a necessity during a majority of the year) the envelope to volume ratio should be as small as possible. In more moderate regions the ratio can and should increase to allow for natural ventilation and natural lighting.

Proper design and detailing of the building envelope has the potential to greatly reduce the yearly energy consumption and also reduce the initial construction cost by reducing peak air conditioning loads. A major item in most building envelopes is the amount and location of glass. The location of glass is much more important than the amount. Glass, the component with the lowest resistance to heat transfer, can be properly oriented and shaded to provide beneficial heat gains in winter and reduce undesirable solar heat gains in summer. A southern orientation for windows is the best in terms of controlling the solar impacts economically. South glass can be shaded in summer with simple horizontal overhangs.

Another method to conserve energy in the envelope design is to use natural earth insulation by placing a building completely underground or by using earth berms. Both methods take advantage of the relatively stable ground temperature. Mean ground temperature throughout the continental U.S. is approximately 55°F. By utilizing the earth, the differential between the indoor design temperature and the winter outdoor ambient temperature is reduced substantially.

The interior design of a facility can also affect energy consumption. The use of light colors reduces the amount of ambient light needed to achieve the minimum recommended foot candle levels. Task lighting can also reduce the amount of electric power used from about 5 watts for general lighting to below 2 watts per square foot for task lighting. Another way to reduce the power consumption and heat load produced by electric lights is to use fluorescent lights exclusively. Fluorescent lamps produce 3½ times more light per watt than incandescent. The use of highly insulated skylights can reduce energy consumption if a photo-electric system is used to control backup electric lights.

All of these techniques lie mainly within the realm of the architect and his design function. But the architect is the main coordinator of the total building design team effort. The architect must assume primary responsibility for the integration of the various building sub-systems into an energy-efficient, coherent whole.

Design Integration

As buildings have increased in complexity, architects have begun to rely more completely on consulting engineers and their recommendations for particular sub-systems design. This trend leads to segregated approaches to individual sub-systems with little overall coordination. The energy situation will require greater coordination between the disciplines to achieve the maximum energy savings at a reasonable cost.

Energy saving architectural techniques, such as daylighting, are essentially fruitless if the architect and electrical engineer don't plan control systems to insure energy conservation. A covered courtyard, designed as a heat trap, must be an integral part of the mechanical system design in order to reduce the actual energy consumption.

The Naval Facilities Engineering Command has organized workshops on energy responsive design, formed an interdisciplinary Energy Initiative Group at Headquarters, and has developed a handbook for architects on all aspects of "energy responsive" architecture.

By planning as many of these energy saving techniques as possible in its new facilities, the Navy will be well on the way to meeting the President's executive order of reducing energy consumption 45%, by 1985, at a minimal increase in military construction costs. □

Energy Plan Development

By KARL D. LIEBRICH and W. E. JOHNSON
Energy Special Programs, Atlantic Division, Naval Facilities Engineering Command

● Norfolk, Va.

The Naval Facilities Engineering Command, in conjunction with the Department of Energy, has sponsored a $250,000 energy study of the Sewells Point Naval Complex, Norfolk, Virginia.

The objective of the study was to develop programs to reduce dependence on oil and natural gas plus an overall reduction of energy consumption.

The complex (SPNC) comprises 4,700 acres located on Hampton Roads in the northwest portion of Norfolk. SPNC has 47,000 persons assigned to sea duties, 16,500 stationed for shore duties and 17,000 civilian employees.

The complex consists of 2,800 structures encompassing a full range of facility types: industrial, administration, bachelor and family housing, medical, warehouses, berthing piers, operations and utilities. During fiscal year 1976, the cost of fuel oil, natural gas and electricity consumed in these buildings or by ships in "cold iron" status was $24 million. (The chart shows the approximate breakdown of energy end-use at the SPNC.)

The study contractor (Batelle Columbus Laboratories) had to identify the energy end-use requirements and recommend technologies which could result in energy system improvements. The overall study included utilities production and delivery systems, transportation, building retrofit, industrial process modification, fuel substitution, solid and liquid waste utilization, and energy storage.

The study was performed with two levels of consideration: energy conservation actions were to be examined for application feasibility to a general community and further were to apply to the Sewells Point Naval Complex community.

Eleven areas were selected for study:

Recommendations for transportation include commuter incentive programs for van or car pooling such as preferred parking, and an improved metro-transit system (in association with civilian operators). Further, the military vehicle fleet should include more bicycles, electric-powered cars and more lightweight fuel efficient gasoline, methyl or hydrogen fueled automobiles.

Implementation of the report is now being studied by the Atlantic Division, Naval Facilities Engineering Command. The report will be used as both a reference and an instrument for further SPNC energy conservation efforts.

It may also serve as a model for studying other communities. Projects based on these efforts will require further detail for application in each community. Necessity for detail gathering and subsequent investigation will no doubt lead to further studies and to implementation of energy saving methods and projects that should greatly reduce oil and gas consumption at SPNC.

Characterization of Energy Consumption consisted of collection of consumption data to date, developing profiles and energy flow diagrams, then projecting future energy requirements of facilities and the overall SPNC.

Energy Conservation in Buildings listed the energy conservation opportunities (ECO) for ten types of buildings, as determined by the building function, and ranks the ECO's according to their potential for energy conservation, required investment and probable user acceptance.

Industrial Energy Consumption studied such industrial processes as electrochemical processing, machine operations, foundry and heat treating, jet engine test cells, and painting facilities for possible areas of energy conservation.

Transportation evaluated current passenger commuter patterns and military (on SPNC) transportation, and proposes alternatives which would influence the use of a metro-transit system; van or car pooling for commuting, and a lighter weight, more efficient military vehicle fleet.

Alternate Energy Sources analyzed the possibility and practicality of using solar, geothermal, nuclear, wind, coal, waste fuel and electricity as alternatives to oil and natural gas.

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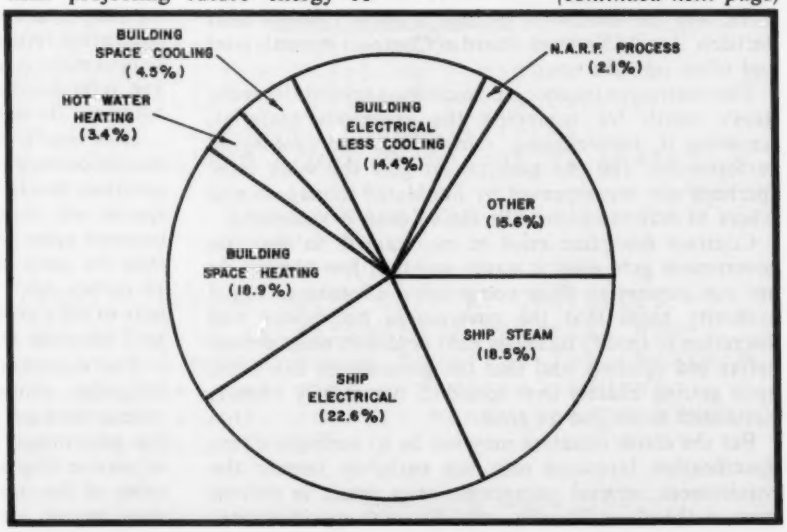

ESTIMATED breakdown of primary energy consumption by end use (total = 9.36×10^{12} Btu)

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Fuel Availability and Cost evaluated the availability and cost of low and high sulphur coal, petroleum, natural gas, nuclear power, synthetic natural gas, waste wood and purchased electricity for the SPNC to the year 2000.

Solid and Liquid Waste Utilization considered in detail the use, availability and cost of solid and liquid wastes, sewage waste, waste oils, solvents and fuels.

Alternate Energy Systems measured the existing energy system and compared it to such systems as total energy systems, dispersed central systems and central energy systems utilizing co-generation, combined-cycle operation, coal gasification and fluidized bed combustion.

Environmental Considerations reviewed federal and state pollution laws as applicable to each energy system under study.

Energy Storage Systems studied energy storage methods as pumped hydroelectric, electrochemical, chemical, thermal, compressed air, inertial, and superconducting magnetics for possible application at the SPNC to level off the daily energy demand.

Community Education and Behavior Analysis included probable community acceptance of the technical energy conservation measures and the education of the community toward energy conservation.

Conclusions and recommendations were formed for the SPNC community. For instance, under "Alternate Energy Systems," the near (1985) goals were the conversion of the central steam plant to burn low sulphur coal. The long term (1985-2000) goals were to replace the existing central steam plant with a central gas-turbine combined-cycle power plant fired with low BTU gas produced by the gasification of high or low sulphur coal and wood. The contractor indicated that by the time the long term goals can become realized the technology involved with second generation coal-gasification will be a commercial reality.

The early recommendation for family housing was to upgrade the combustion system of the existing gas furnaces presently advised or under study by the major gas institutions. The long term recommendation is to replace the natural gas heating systems with shallow well-water source heat pumps with a hydronic loop feeding multiple family housing units. This heat pump was found to be the most energy efficient and cost effective for the heating/cooling systems studied for family housing.

In the industrial operations, insulating the walls of the heated tanks and lowering the temperature of electrochemical processing tanks were chosen as effective ways to reduce energy consumption. □

ON ADVICE OF COUNSEL

By WILLIAM H. SPECK
Counsel
NAVFAC HQ

"The race is not to the swift, nor the battle to the strong." —Ecclesiastes

Minimizing risks—playing the averages—has a part in claim and litigation management, just as do percentage shots in tennis. Contract actions ought to take into account the costs to the government (if later found wrong), as well as costs imposed on the contractor (which become government costs if he later is found right), and the risks.

In a too common situation, the contractor buys and even installs materials not complying with the specifications, the contracting officer orders removal and replacement, and the contractor pursues a claim through final decision, Armed Services Board of Contract Appeals trial and often into the courts.

The contractor incurs costs sometimes several times the item's worth for scrapping the erroneous material, removing it, repurchasing, reinstalling, and prolonging performance; and the government gets the work later (perhaps not recompensed by liquidated damages) and labors to defend against the claim, even if successful.

Contract discipline must be maintained, so that the government gets what it wants and that low bidders do not cut corners to their competitive advantage. Legal authority holds that the government has power and discretion to specify its needs, that objectors must protest before bid opening, and that the government can insist upon getting exactly that specified, not merely what is contended to be just as good.

But the claim situation may not be so perfectly clear. Specification language may not certainly impose the requirement, several paragraphs may speak in several tones or the plans (literally subordinate to specifications) may indicate differently. Referenced specifications and trade usage may positively deny the obligation.

The contractor may assert oral conversations adopting his interpretation, may have made material submittals indicating (at least in retrospect) his position, and inspectors and resident officers in charge of construction may have accepted most of the work based on the contractor's interpretation.

Legal authority can be cited holding none of these special circumstances change the result, and yet sometimes one or several of them cause contractors to prevail. The ultimate result will turn upon the view of the picture in a legal record by judicial officers.

When the government has been willing to take a credit for the variation and insists on removal only after the contractor refuses, the legal system wonders whether the requirement is essential, particularly when trade usage and referenced specs do not impose it, and government witnesses do not convict.

How vital is it that siding be 8-10 inches wide vice 12 inches, conduit rather than piping be used for wiring, that sprinkler heads be placed in non-combustible concealed spaces, etc. And when the requirement is nevertheless imposed upon, the government may not insist upon more than the specs originally required (cutting siding only to 10 inches, not 8 inches). Perhaps the government ought only to ask a credit for the lesser value to itself of the non-spec material rather than upon costly replacement.

The contractor may accept this lesser cost without litigation, contract discipline is maintained, the contractor does not gain from his violation of the specs, and the government can be certain it will not, after years of expensive litigation, be obliged to pay several times the value of the item. Perhaps, after erroneous installation, some means other than full replacement can give the government all it needs. Though taken into litigation, many differences are still settled. □

Naval Facilities Engineering Command

SITUATION REPORT

USUHS NEARS COMPLETION - The Uniformed Services University of the Health Sciences, (USUHS), construction program will be completed this summer at Bethesda, Md. The Naval Facilities Engineering Command, who is construction agent for the medical complex, reports that 95% of work scheduled has been completed. Initiated in August 1976 with 32 students, occupying temporary facilities, the university will soon be able to accommodate 700 students annually. First phase construction was completed in August 1977. Congress has mandated that USUHS graduate 100 medical students by 1982 and completion of required facilities seems to insure attainment of that goal.

(NAVFAC Code B-00)

CONSTRUCTION UPDATE AT KINGS BAY, GA. - Critical dredging projects to deepen entrance channels and turning basins have been completed at the new Submarine Support Base permitting the USS Simon Lake a scheduled arrival in mid-summer. Approximately 12 million cubic yards of material have been removed from Kings Bay and the adjacent intracoastal waterway during the past year. A floating drydock will be homeported at Kings Bay with a $9 million drydock mooring facility scheduled for completion in January. The base will permit the support and service of the Navy's Atlantic undersea craft and will be homeport of Submarine Squadron 16, currently based at Rota, Spain. The USS Simon Lake is the forerunner of the squadron. Construction contracts for 250 units of base housing are planned for award in October. The FY80 program is planned to include $20 million for personnel support facilities. The total scheduled expenditure will amount to approximately $100 million other than housing costs.

(NAVFAC Code PC-1)

REFERRAL LIBRARY FOR FACILITY SUPPORT CONTRACTS - NAVFACINST 11014.50 of 12 Jan 1979 established a referral system for maintenance service and maintenance construction contract technical provisions. Activities desiring guideline clauses for facility support contracts should contact their geographical EFD Maintenance Division for assistance.

(NAVFAC Code 100)

Announcing

THE COMMANDER'S EDITORIAL EXCELLENCE AWARD

Ted C. Murphy, professor emeritus of the Naval School, Civil Engineer Corps Officers, (CECOS) has received the first annual Commander's Award For Editorial Excellence for contributions to *The Navy Civil Engineer*.

Murphy's articles were considered the best published for the 1977 publication year by a panel of judges comprising of Capt. Leroy Lawson, CEC, USN, then commanding officer of CECOS; Mrs. Judith Johnston, NAVFAC Command Historian and the editor of the publication.

Inasmuch as the Commander of the Naval Facilities Engineering Command, Rear Admiral Donald G. Iselin prefers to personally present the award actual presentation was delayed until this spring.

Pictured left, is the recipient Ted Murphy (left) and Rear Admiral Iselin during the presentation held during graduation ceremonies of Class No. 150 of the naval school.

The award for publication year 1978 will be announced in a later edition. □

THE COMMANDER'S AWARD

For Outstanding Contributions
to the

NAVY CIVIL ENGINEER

Official Publication of The Naval Facilities Engineering Command, Civil Engineer Corps and Navy Seabees

Presented To

Professor Emeritus Ted Murphy

For his series of stimulating articles that have enhanced the quality of the publication and generated high readership interest.

Awarded the First Day of July, A. D. 1978, in the City of Alexandria, Virginia.

D. G. Iselin

DONALD G. ISELIN
Rear Admiral, CEC, USN
Commander,
Naval Facilities Engineering Command
and Chief of Civil Engineers

The Commander's Remarks

There are few members of the Civil Engineer Corps that do not know Ted Murphy and remember him well from the days when he was an active instructor here at CECOS. I wanted the members of Class 150 to meet him . . . as Ted Murphy will undoubtedly cross their professional paths in some manner.

Ted was a Civil Engineer Corps officer in both World War II and the Korean War and joined the CECOS faculty in 1952. His experience in engineering management principles led to the creation of an Engineering Management Division at CECOS. His imaginative and practical formation of the course led to his professorial rank.

And when he retired in 1975 he was named Professor Emeritus, the only person to be awarded that title at CECOS. However, Ted did not leave the corps upon his retirement as he has continued to contribute thought provoking articles to *The Navy Civil Engineer*.

Last year, an editorial review board selected Professor Murphy as the outstanding contributor to the magazine. Today, is the first opportunity that I have had to personally present Ted with the award . . . the *first* annual award to contributors . . . with my personal thanks for his continuing interest in the publication and the Civil Engineer Corps. □

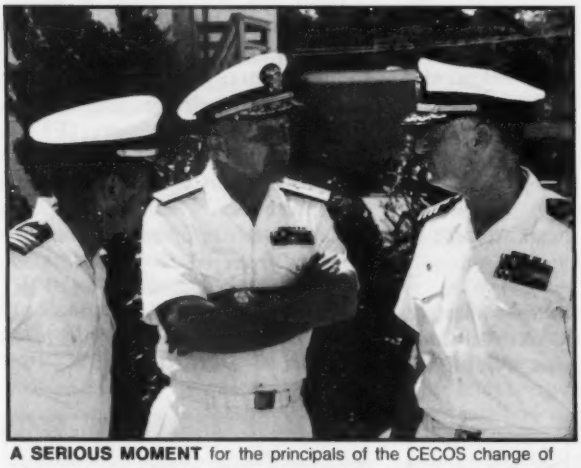
A New Flag Officer For The Civil Engineer Corps

The Naval School, Civil Engineer Corps Officers (CECOS), Port Hueneme, Calif., witnessed a change of command on May 8, and also the elevation of its former commander, Capt. James T. Taylor, CEC, USN, to the rank of rear admiral.

Presiding at the dual ceremony was Rear Admiral William M. Zobel, CEC, USN, vice-commander of the Naval Facilities Engineering Command (NAVFAC) and Deputy Chief of Civil Engineers.

RAdm Taylor's new assignment is that of Director, Shore Facilities Planning, Office of the Deputy Chief of Naval Operations (Logistics) relieving Rear Admiral Robert F. Jortberg, CEC, USN. □

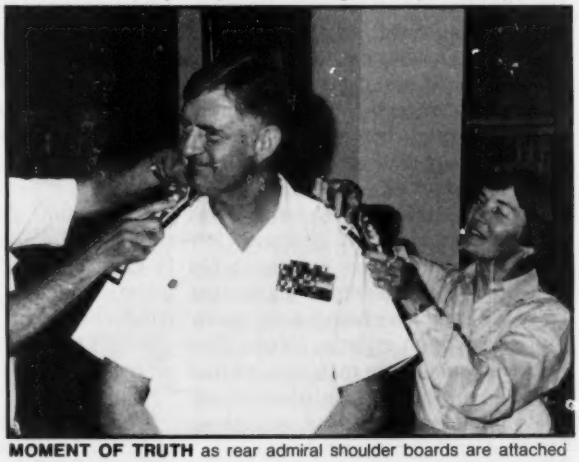
DEPUTY COMMANDER of NAVFAC, RAdm William M. Zobel, (left) prepares present Capt. James T. Taylor with two star shoulder boards indicating his new rank of rear admiral. Enthusiastic onlooker (right) is Mrs. Taylor.



A SERIOUS MOMENT for the principals of the CECOS change of command are: Cdr. David N. Hull, ecxecutive officer who assumed command from Capt. Taylor; RAdm Zobel and RAdm-Select Taylor.

THE SMILES TELL IT ALL — Capt. and Mrs. Taylor, Cdr. and Mrs. Hull pictured at the reception immediately following the Change of Command ceremony and prior to the "big event" (see below)

IT'S OFFICIAL with the phrase "I relieve you, sir." by Cdr. Hull to Capt. Taylor. The newest flag officer of the Civil Engineer Corps is the first commander of CECOS to attain that rank.



MOMENT OF TRUTH as rear admiral shoulder boards are attached Capt. Taylor by RAdm Zobel (left) and Mrs. Taylor. RADM Taylor has become director of the Navy's shore facilities planning office. (see page 29)

TECHNICAL NOTES

It is said there's always a way to build a better mousetrap and this section of The Navy Civil Engineer is designed for ready exchange of better ways to perform Public Works functions. Readers who desire additional information are urged to contact the contributor directly for specific details. Contributions are urged from field installations and should be directed to David Williams, PW Technical Coordinator, Code 100, Headquarters, Naval Facilities Engineering Command, 200 Stovall Street, Alexandria, VA 22332; Autovon 221-8182 or (202) 325-8182. Coordinator for RDT&E subjects is Eugene H. Early, Code LO3C, Civil Engineering Laboratory, Naval Construction Battalion Center, Port Hueneme, CA 93043; Autovon 360-4070 or (805) 982-4070.

Blistering of Polyurethane Roof Insulation

A recent technical bulletin published by the National Roofing Contractor Association (NRCA) has acknowledged the fact that problems are occurring with various types of polyurethane insulation.

Extensive blistering of built-up roof surfaces has been observed. This apparently is the result of degassing and/or vapor release of the polyurethane when in contact with hot asphalt (400°F).

The NRCA recommendation is to install a thin layer of fiber board, fiber glass insulation, or other board insulation over the top surface of the polyurethane insulation, staggering the joints from the layer below, and then apply the roof membrane as specified by the designer.

The National Bureau of Standards, as well as the roofing industry, is currently conducting tests and research in an attempt to rectify this problem.

Additional information may be obtained from J. M. Reavis, Code 1024, Atlantic Division, NAVFAC, Autovon 690-7121. □

Cellulosic Insulation Materials

The Energy Research Development Administration (ERDA) Report 77-23, Survey of Cellulosic Insulation Materials, dated January 1977, has recently been reviewed. This material has been used for residential building insulation for several decades and currently represents 30%-40% of that market. It has two attractive features, low cost and high thermal resistance. On the other hand, the report shows that 6 of 19 samples exceeded the moisture absorption criteria. (Note: This generally applies to materials treated with ammonium sulphate and aluminum sulphate and not those treated with boric acid.)

In addition, 6 samples supported fungal growth and again, the boric acid treated samples came out with acceptable results. Finally, 11 samples produced excessive corrosion on steel, copper and aluminum. The report does not address the adverse effects of moisture absorption upon thermal conductivity.

Cellulosic insulation should not be specified until assurance is available that moisture absorption is sufficiently low, that it is resistant to fungal growth, that you will get the thermal conductivity you expect as installed, and that there is not steel, aluminum or copper to corrode.

Additional information may be obtained from A. S. Gallup, Code 1021, LANTDIV, Autovon 690-7121. □

Minor Construction Authority

A CNO message provides interim guidance for claimant funded minor construction (CFMC) occasioned by changes in the minor construction authority. A new section on minor construction will be included in the forthcoming revised OPNAVINST 11010.20, Facilities Projects Manual.

Until the new manual is issued, claimants and activities desiring further guidance or interpretation should contact the Maintenance Division of their geographic Engineering Field Division (EFD), claimant support EFD, or NAVFACENGCOM headquarters as appropriate.

Additional information may be obtained from W. H. Russell, Code 102, Atlantic Division, NAVFAC, Autovon 690-7121. □

Facility Support Contracts

Facility Support Contracts is the new title of a group of contracts which includes maintenance service contracts and maintenance construction contracts. They are noted as follows:

- Maintenance service contracts. Service Contract Act of 1965—applicable; examples—custodial, garbage and refuse, and air conditioning maintenance.
- Maintenance construction contracts. Davis-Bacon—applicable; indefinite quantity contract (open-ended); examples—interior/exterior painting of family housing and pavement maintenance.

Details for the contracts are in Section 9 of the Contracting Manual (NAVFAC P-68).

Additional information may be obtained from G. J. Bosch, Code 1025, Atlantic Division, NAVFAC, Autovon 690-7121. □

Strengthening the Activity Civil Engineer

By LCDR J. G. PALMBORG, CEC, USN
Senior ACE, PWC, San Diego

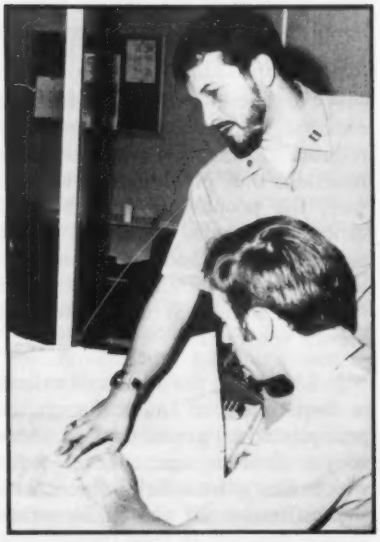
● San Diego, Calif.

As a consolidated organization, the Navy Public Works Center (PWC), San Diego, provides complete public works service to all naval activities within the San Diego area.

These customers range from large to small; from major property holders with millions of dollars for maintenance of real property (MRP); to small one-office tenant commands with very few dollars.

The relations between PWC and the customer are provided by either a staff civil engineer (SCE) an officer assigned to the major command, or by an activity civil engineer (ACE) located within PWC. Based on actual fiscal year figures, the customer commands served by the five ACEs at PWC, San Diego, represented 52 percent of the total PWC workload or approximately $52 million worth of purchased services.

With such a huge volume of work, the Center's ACEs have, in the past, devoted most of their time expediting work. Expediting, as such, included reviewing and processing work requests, coordinating proper funding, monitoring work request processing, continuing checks on status, material procurements, and troubleshooting. These time-consuming actions were devoted to the in-house PWC system and commenced only upon the initial action by the customer.



PWC ACEs Lt Paul Olszewski (standing) and Ens. James Gustafson confer on plans for a Center customer.

The ACEs greatly assisted work request processing, but did not serve to strengthen the PWC organization. More importantly, the use of junior officers for expediting work requests did not use their full capabilities nor did it improve overall customer guidance.

A program has now been established to remove the ACEs from the day-to-day work expediting and allow them to provide true public works officer consultation to customer activities. Included would be facility planning and programming, special or military construction (MCON) project development, effecting facility maintenance plans, and other consultation.

In executing the program, two problems had to be overcome. These were breaking the traditional ACE role as troubleshooter on work request problems, and, providing more training for the ACEs.

Internal procedures now have been strengthened and developed to allow the production management system (PMS II) procedure to run on its own. The ACE now provides closer contact between the customer and the Public Works Center by establishing milestones for jobs and requesting feedback information from the various processing points within PWC.

Based on enhanced two-way communication, the ACEs can provide improved liaison in negotiating job starts and completions.

An active training program has been developed to include formal training, such as the Civil Engineer Corps Officers School (CECOS) at Port Hueneme, and informal training which includes briefing sessions with PWC and SCE personnel. These sessions involve subjects such as the Annual Inspection Summary (AIS), budgeting, maintenance requirements, contract administration, special projects, minor construction projects, and planning and programming.

The program has endeavored to provide basic information and knowledge to each ACE concerning all the facets of public works functions with which they will become involved. It provides fundamental background for laws and regulations associated with daily business.

The program has been concentrating on building a strong, personal relationship with each customer activity. Specific actions have included obtaining knowledge concerning the mission, functions, and various facilities owned and operated by the customers. The end product includes gaining the customers' confidence in the ACEs as the maintenance and repair experts.

Gathering of customer information (i.e. budgets, long-range plans, annual inspection summaries, dollar volume of PWC services, history of business, master plans, etc.) provides a basis for developing maintenance plans advising the customer of long-range major maintenance actions that will permit advance budgeting.

The end result of this program is to develop a stronger work processing system within PWC San Diego for work expediency and improved overall facility service.

And, finally, it will provide maximum utilization and training of junior CEC officers for future development and responsibility.

The program was started just a few months ago and still has a long way to go. But improvements are being observed, both internal and external to the Center. The role of San Diego activity civil engineers is changing.

□

Maintenance Service Contracting—

friend or foe?

By LCDR J. H. T. MILES, CEC, USN
P.E., S.C.
Assistant Director
Facilities Management Department

● El Toro, Calif.

Almost to the man Public Works Officers (PWO) at Navy and Marine Corps activities find themselves using to some degree a maintenace service contract to accomplish facilities maintenance functions. The degree of that use varies from activity to activity and from location to location.

How much customer satisfaction is associated with maintenance service contracting? It depends on who is asked for an opinion. Like the degree of usage, the satisfaction with the contractor performance varies from PWO to PWO and reflects each officer's own unique set of circumstances.

The 1970s are a period marked by the steady increase in both the number of service contracts and the total annual dollar volume spent on these contracts. Principal reason for the increased use has been the reduction of the U.S. Armed Forces following the Vietnam war. As in similar post-war periods, the number of men in uniform and the material inventory has been substantially reduced. Likewise, the number of military establishments and civilian employees have seen a steady downward trend. Even closer to home, the Civil Engineer Corps officer strength of the Navy has been reduced by approximately 30% since the peak of the Vietnam war. It is not surprising that numbers of the civilian personnel of the Public Works departments have been reduced as well.

As is generally the case with such reductions, personnel strengths are reduced significantly faster than the functions they provide. Said another way, the people are gone but the functions remain. It follows that a very logical method for accomplishing those remaining maintenance functions is through the maintenance service contract.

In addition to the peaks and valleys in Department of Defense strengths precipitated by armed conflict, there is yet another agency-level force which has substantial influence on the utilization of the maintenance service contract. In 1966 the Office of Manpower and Budget (OMB) issued a policy directive, Circular Number A-76, which essentially stat-

ed that *the agencies of the Federal government will rely on the private sector to supply their needs.* In effect, the Federal government desires to contract with private enterprise to the maximum extent possible for the goods and services it requires. To implement this policy, OMB accompanied its directive with an analysis apparatus requiring Federal agencies to routinely examine over 100 different commercial and industrial products or services, and determine if they qualify as an in-house function or if they should be acquired by contract. This analysis apparatus is known as the Commercial/Industrial review process and is the counterpart to what is recognized by the private sector as the 'make or buy' decision. A number of the products or services is provided by activity Public Works Departments or Navy Public Works Centers. The commercial/industrial review system has had a net effect of facilitating contracting out for many Public Works-type functions.

"...the people are gone but the functions remain..."

The maintenance service contract, or the service contract, in reality, amounts to an extension of the resources of the Public Works officer. A central issue in the debate surrounding the usefulness and effectiveness of the service contract is whether or not the Public Works officer is provided with an extension of his span of control commensurate with his expansion of resources. Do the established procedures for procurement and administration of the service contract give the Public Works officer the necessary tools to select and manage contractor effort in a way that compares favorably, both economically and qualitatively, to accomplishing the same function in-house?

A recent study of twenty-five Navy and Marine Corps activities in the Continental United States revealed that all of them use the maintenance service contract to accomplish various functions. The study was to investigate whether some factors which were judged to be influential in service contractor performance at one activity were, in fact, similarly influential at other activities.

The information was gathered through the use of a questionnaire completed at the twenty-plus activities by the Public Works officer or someone occupying a level of departmental visibility similar to that of the Public Works officer.

The influencing factors, or parameters, investigated are described generally as:

- Service Contract administration organization
- Armed Services Procurement Regulations (ASPR) requirement for low bidder award
- Quality of the contract documents
- Geographical location of activity

The conclusions reached by the study are described for each of the four in influencing factors.

Service Contract Administration

The service contract, unlike the construction contract, requires a slight modification of contract administration responsibilities. The Naval Facilities Engineering Command (NAVFAC) administers construction contracts for the Navy and Marine Corps through its various Engineering Field Divisions and officers-in-charge of construction (OICCs and ROICCs). For these services, the NAVFAC organization is reimbursed by the Navy or Marine Corps command sponsoring the construction. Construction management services rendered under this concept involve the total spectrum of contract administration including advertising and awarding the contract, inspecting and certifying the work, initiating progress payments to contractors, and effecting change orders.

The same NAVFAC organization provides contract administration services for the maintenance service contract; however, these services are

"...the service contract...amounts to an extension of the PWO resources."

not quite the same, and that difference could very well be a factor related to lethargic organizational adjustments and reallocation of resources at the activity level. Essentially, the difference lies in the fact that base facilities maintenance is an activity responsibility paid for by Operating and Maintenance (O&M) dollars. The activity, therefore, has the responsibility for inspecting and certifying that work which is accomplished by the maintenance service contract.

The local OICC organization does provide certain other services such as advertising, award, and progress payments, but does not inspect the work or certify that it has been done for payment purposes. The OICC and NAVFAC organizations do not have the responsibility for these functions nor are they staffed to do it.

Many maintenance service contracts have their genesis with the commercial/industrial review process which determines that "contracting out" is less costly to the government than providing the same service in-house.

In most cases, the reality of converting a function from in-house to contract does not preserve necessary personnel billets which can be redesignated and reassigned to pick up the additional inspection and the work certification requirements the activity has gained by turning to the Maintenance Service Contract.

At one activity, over the five year period investigated, the service contract volume increased to approximately a dozen different contracts and an annual dollar volume exceeding $500,000. During this same time, no formal organizational commitment was made to establish an adequate inspection force. Some

(continued next page)

Maintenance Service Contracting

(continued from preceding page)

inspection efforts were made over these years, but principally it was after a contract was in trouble. The resulting inspection was not carried out by personnel specifically and organizationally defined for that purpose.

It appears that failure to allocate resources so that inspector billets realized a commensurate increase with the number of service contracts was a rarity; if it happened at all. Because the responsibility for inspection and work certification is retained by the activity, proper personnel allowance modification must necessarily take place if total effective service contract administration is to be realized. The proper time for this identification and reallocation is at the time the decision is made to contract for a service rather than do it in-house. Further, the responsibility for this identification is with the activity conducting the C/I review and for whom the service contractor will provide services.

The commercial/industrial review process does not preclude the activities making such identifications but current procedures do make it easy for the analyst to ignore such real world factors as the inspection requirement inherent in contracting out for services.

Extreme dissatisfaction with contractor performance can possibly be avoided simply by not falling into the trap of ignoring a requirement for increased in-house inspection effort with each increase in the utilization of the Service Contract.

ASPR Requirement For Low Bidder

The Defense Acquisition Regulations (DAR) and its derivative, NAVFAC P-68, requires that formally advertised contracts be awarded to the low conforming responsible bidder. Formally advertised contracts are applicable to the maintenance service contract as well as to construction and other varieties of procurement contracts.

The low bidder award policy has long been an area of criticism relative to government procurement procedures. The regulations do, in fact, contain all of the rhetoric and direction that guide the contracting officer to a determination of the "low conforming responsible bidder." However, the realities of implementing these rules and regulations for such determination produce, all too often, an award to the contractor who is in fact the low bidder, but who is not necessarily conforming or responsible. Determination of a conforming and responsible bidder is, to be sure, a science that is less than precise.

Compliance with the ASPR's mandate for a low bidder award in the service contract area seemingly produces a preponderance of "low bidders" who are neither conforming nor responsible but who, nevertheless, get the award based on the low bid criterion.

Many reasons could contribute to this condition but in general the maintenance service contractor population contains fewer capital resources, less managerial talent, and a larger portion of workers identified with lower skill levels. Bidders drawn from such a population increase the probability of being trapped by the low bidder regulation and thereby being stuck with the contractor who either cannot perform or who will not perform once a money-losing situation becomes obvious to him. In such a situation both contractor and government lose.

The unfortunate part is that, in many cases, pre-award judgment on a contractor's ability to perform or not perform can be made with some degree of confidence. However, the simple determination that he cannot perform, at least in the OICC's judgment, is not grounds for selecting the next higher bidder. Documenting evidence sufficient to disqualify a contractor requires such a mountain of paperwork and administrative red tape, that most OICC offices are not capable of handling it. The result is that the low bidder wins again, and the government will end up getting less than it bargained for.

One indicator by which a contracting officer may judge a contractor's ability to perform, is a cost comparison between the contractor's bid price and the government estimate. Each formally advertised contract is accompanied by a government estimate, although that estimate is not available to potential bidders. In some cases, the low bidder has bid a price which is less than 50 percent of the government estimate. This does not mean that the government estimate is sacrosanct — government estimating can be and will be wrong too on occasion. In many instances it is conservative, but in most all cases it is based on estimates for all things which are required by the contract, including such things as required labor rates, paid holidays and insurance, as well as the items of work to be provided.

Bid estimates substantially lower than the government estimate give cause to suspect the bidder for a myriad of potential reasons: he does not understand the scope of the work; he does not have an effective method for estimating costs to do all of the required work; he intends to recoup with change orders after the award; or he does not plan to do all of the work for which he is paid. All of these potential reasons are cause to question the ability of the contractor, but they are not grounds on which his bid can be rejected after it has been confirmed. Once under contract, the means by which he will attempt to recover from a too low bid will begin to be identified. Whatever means he chooses will be less than satisfactory to the contracting officer or the customer receiving the services.

"... the government will end up getting less than it bargained for."

It would seem that some modifications of the ASPR's surrounding the low-bidder concept are long overdue. It would also seem that such modifi-

cations should include provisions for permitting the local contracting officer to be more selective in his solicitation of potential bidders, have more authority in accepting or rejecting bidders, have more flexibility in negotiating contracts, and have more flexibility in awarding contracts which are formally advertised and competitively bid.

Quality of Contract Documents

The conclusions reached in the study relative to this factor indicate that there is widespread belief that preparation of a quality contract document aids in the realization of a better quality of work from the service contractor. While a quality contract document is not a panacea for solving all of the problems associated with maintenance service contracting, it does establish conditions under which extracting quality performance from a contractor is made easier.

This, of course, assumes that the potential for quality performance is already there. The contractor and contracting officer's jobs are indeed easier and more productive if the purchased services and the conditions under which they are to be performed are well defined for all.

The preparation of the contract document or documents is an activity-level responsibility; and as a result this facet of service contracting is another area where the activity can help itself. The Public Works Officer is definitely in an advantageous position if he has within his organization an individual or individuals who can produce a quality set of maintenance service contract specifications. By not maintaining such a capability, the PWO is denying himself the ability to locally influence his maintenance service contracting effort.

Additionally, NAVFAC P-34 contains maintenance service-types of specifications which give the activity-level specification writer a head start in getting a quality document.

Population Density

A fourth factor considered in the study was the contribution to the performance of maintenance service contractors made by the size and composition of the metropolitan areas surrounding the military installation. In other words, a large metropolitan area, such as Los Angeles, may, according to the presumption, contain a high density of potential service contractors. If such is the case, this condition could very well intensify the competition to the point where the low bidder would in most cases have a bid lower than his costs for doing the work called for by the contract.

In most cases a contractor finding himself in such a situation, for whatever reason, would choose first to maintain his solvency and gamble on how little work he could do while continuing to get paid for it. The Public Works officers opinions collected relative to this factor did not support the contention that the character and size of the population surrounding the activity contributed in any significant quantity to service contractor performance.

The study referred to examined, among other things, four factors which were thought to have some influence on the performance of maintenance service contractors at one Marine Corps Air Station and possibly at other Navy-Marine Corps activities. Certain conclusions were reached and have been described above. There are, no doubt, other factors which could be equally as influential as those discussed and they should be identified and examined as resources and conditions permit. The case too often, however, is that resources and conditions do *not* permit.

For those activity PWOs and OICCs who happen to be in such an environment or for those who are completely new to the service contracting game, the following short 'shots' may assist in avoiding unnecessary heartburn and tribulation with this type of federal procurement.

- Prior to going forward with a service contract, identify the necessary staffing for inspection and work certification.
- Ensure station personnel performing inspection and work certification functions are properly interfaced with the OICC organization.
- Prepare a sound contract document package.
- Involve the customer in contract document preparation and review.
- Involve the OICC/ROICC staff in contract document review process.
- Anticipate and expect some problems early after contract award.
- Utilize one year extension provision for contractors who are deserving.
- Investigate consolidation of contracts which provide similar or like functions.
- Utilize requirements for bonding.
- Don't avoid change orders if they are required.

Expanding utilization of the maintenance service contract is a fact of life within the Department of Defense and it becomes a bigger and bigger business each day. The magnitude of this business mandates more managerial attention than it has received in the recent past. It likewise requires innovation and additional exploration if the maintenance service contract is to be a viable and cost effective tool for accomplishing base maintenance functions. □

ABSTRACTS OF THESES

By LT NEIL BROMILOW
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CECOS

Many recent Civil Engineer Corps Officers who have completed advanced degree programs sponsored by the Naval Facilities Engineering Command have written either a thesis or an engineering paper.

The two papers selected below represent the diversity of topics studied. *"Zero-Base Budgeting for Navy Public Works"* has useful insight into the budgeting process, while the other thesis analyzes a timely subject area, namely: energy and our lack of viable resources.

The Moreell Library at the Naval School, Civil Engineer Corps Officers, maintains these papers for loan. The collection is growing, but represents only 50 percent of the available papers which have been completed in the last few years. All thesis and major papers are solicited for use by the Civil Engineer Corps community.

SOLAR ENERGY FOR THE NAVAL SHORE ESTABLISHMENT

Key Words: Solar Energy; Solar Design; Energy Sources; Navy family housing solar heating.

Abstract: This thesis discusses the background and extent of the national energy crisis and documents the need for alternative energy sources for the United States Navy. In addition to conventional fossil fuels, other energy sources such as wind, water and geothermal are discussed. An analysis is made of the advantages, disadvantages and techniques of one of these alternatives, solar energy conversion. The National Solar Energy Program is reviewed, as is the role of the Department of Defense and the United States Navy in this program. Methods of "retrofitting" existing Navy facilities with solar energy systems are discussed, as are new construction techniques. The thesis further contains techniques for life-cycle costing of alternative solar energy systems, which includes computer model programs such as BASIC Language, F-Chart calculations, and SOLCOST calculations. The thesis concludes with suggestions for establishing a viable solar energy program on an activity or individual basis. A comprehensive reference list and bibliography is provided to identify where technical and engineering details can be found.

Reference: *GEIBEL, B. B., LCDR, CEC, USN,* "Solar Energy for the Naval Shore Establishment", Naval Postgraduate School, December 1977.

Thesis: *Master of Science in Management*
AD # A050026

ZERO-BASE BUDGETING IN NAVY PUBLIC WORKS

Key Words: Public Works Budgeting; Zero-Base Budgeting; Navy Public Works.

Abstract: This thesis has two broad objectives. The first is to examine and gain an understanding of zero-base budgeting (ZBB) and the second is to relate ZBB, where applicable, to the Navy public works organization.

The study includes a discussion of the ZBB concept; traditional budgeting is examined to gain insight into the need for ZBB; a ZBB theoretical model or process is suggested; the promises and shortcomings and the assumptions underlying ZBB are discussed; and a discussion of the practice as compared to the theory of ZBB is provided.

The suggested theoretical ZBB model consists of long range planning, establishment of objectives and budgeting assumptions by top management, identification of decision units, development of decision packages, ranking of decision packages and evaluation. Decision packages are further divided into purpose and objectives of the decision unit; identification and analysis of alternative methods; costs, benefits and associated impacts; identification and analysis of service levels; and identification of performance measures. The ZBB model is developed and applied to the Navy public works Real Property Maintenance Activity (RPMA) functional areas. The study finds that ZBB generally is applicable to Navy public works.

The study also explores implementation problems and strategies for successful implementation. The study concludes that ZBB does merit consideration in public works.

Reference: *TANNER, T. J., LCDR, CEC, USN,* "Zero-Based Budgeting in Navy Public Works," University of Pittsburgh, 1978.

Thesis: *Master of Public Works*

Sea(bee) Stories

Ouch? Gotcha!

Admiral Donald C. Davis, USN, Pacific Fleet Commander-in-Chief, recalls a game of one-upmanship with the Seabees during World War II.

Admiral Davis was stationed temporarily at the Cubi Point airfield in the Philippines while Seabees were putting the finishing touches to the project. There was a friendly rapport as well as a spirit of competition between the squadron and the Seabee unit.

The night before the squadron was to fly out to the aircraft carrier, the pilots took a large cone painted with red checks to match the airplane tails and attached it to a large sculpture of the Naval Construction Force "Bee" emblem marking the camp entrance.

The pilots' satisfied laughter at "putting one over on the Seabees" turned into chagrin upon reaching the carrier. There they discovered that while they had been busy putting a tail on the bee, the 'Bees had been busy painting a prominent Seabee emblem on the side of every aircraft in the squadron.

"We heard about that for a long time," said Admiral Davis.

The Seabees have a sting, too.

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Maps By Computers

By BERNARD F. WHITE
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● Alexandria, Va.

Computer graphic systems are becoming increasingly popular as a cost effective way of map production. Advancements in automated cartographic methods have created a new era of sophisticated map making. With the advent of interactive computer graphics equipment, the technology of establishing automated mapping systems has gained wide utilization by regional planners and real estate managers.

The Systems Analysis Division is conducting a feasibility study for NAVFAC to include a benefit/cost analysis of alternatives for development of an Automated Mapping System.

Most users initially turn to automated mapping systems to alleviate the shortage of skilled drafting personnel. Other reasons include the speeding up of the map making process, the shortening of the time for map revisions, the potential for cost savings, the reduction of manual drafting work, the ease of conversion to the metric system, and the improvement of the aesthetic qualities of maps.

Additional benefits can be gained by having a digital graphic data base serve as a common collection medium for a wide variety of data overlay displays. For example, real property lines, bearings and distances can be overlaid and displayed with major roads, major buildings or both. The potential combinations are innumerable.

Finally, the best rationale for automated mapping systems is that they have been found to be cost effective. Automated graphic systems have shown savings of from four to ten times the cost of manual methods.

Automated graphic systems consist of three phases; data input, data storage and processing, and data display and output. Each of these phases requires unique hardware and software to perform the work required.

Data input, also called data capture or geocoding, relates to creating a data base by means of a digitizer and a keyboard that records *x* and *y* coordinates from an existing con-

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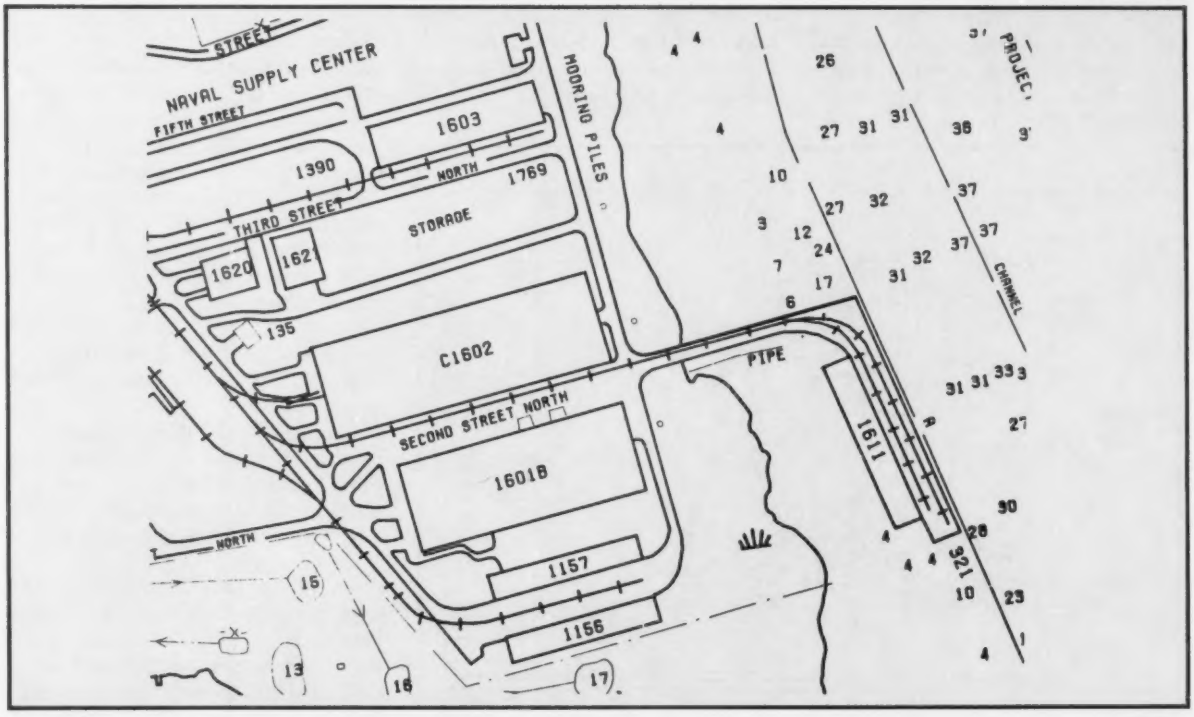

A COMPUTER PLOTTED NAVY MAP IS PICTURED IN THIS SAMPLE.

maps by computers

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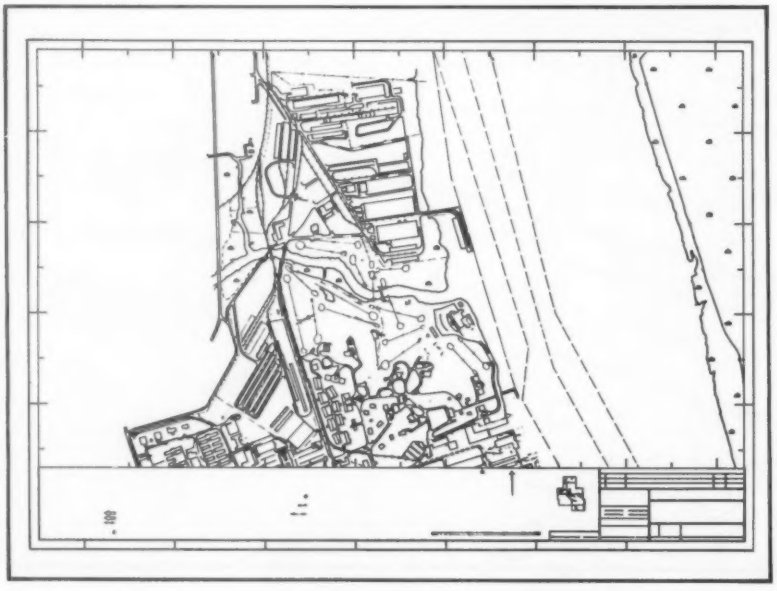
trolled base map. The digitizer is an input device which converts line drawings and other graphic representations into digital values for storage in the computer.

To determine the location of a mapped feature on the earth, it is necessary to have control. Briefly, control consists of a set of points on the earth's surface whose geographic position in coordinates such as longitude and latitude or state plane coordinates, and elevations have been determined to a high degree of accuracy. Computer programs exist to update and edit the data files once they are created to maintain control.

The second phase of automated graphic systems, data storage and processing, consists of data manipulation that takes place between capture and display. Processing functions include automated error correction, selective retrieval of cartographic information and generation of display files for plotting map output.

The final phase, map output, can be accomplished with a host of output devices, some of which are capable of at least as fine a line quality as any skilled draftsman or cartographer. A sample of line work drawn by graphic plotters used in the computer system described is shown in the first drawing. The line work is reproduced to scale with text data included.

The computer plotted map shown in the second drawing illustrates the scale change output capability. As another example of the system's versatility, the software excluded the text data of the second drawing to demonstrate the ability to delete things that would not show at smaller scales. Similarly, color maps using tones of various hues, brightness, and saturation are well within existing commercially available equipment. The second drawing was originally drawn in three colors. Map outputs may also be in the form of ink drawings, scribe sheets and photo-exposed negatives and positives.



THE NAVAL BASE COMPLEX AT CHARLESTON, S.C. (SMALL SCALE) is shown in this sample computer graphic map.

The Navy's Facilities Planning and Real Estate management responsibilities include establishment and maintenance of a large number of planning and real estate maps, legal records and the data contained therein. These maps are amenable to automation.

The planning maps are those Navy maps developed and maintained by Navy planners involved at all levels of managing Navy facilities matters. These maps include General Development Maps of two types: those which illustrate existing conditions and those which illustrate existing and planned conditions. Maps of the first type are referred to as Existing Condition Maps (ECMs) the second type are referred to as General Development Maps (GDMs). ECMs illustrate a Navy activity or complex and its existing buildings, structures, roads, topography, etc. GDMs are more of a short-range development plan for an activity or station and show the existing facilities as well as the planned and programmed facility requirements.

Real Estate cadastral records are records selected for retention pertaining to land and interests under control of the Navy. Real Estate Summary Maps (RESMs) are used to depict legal information and can include land acquisitions, disposals, outgrants, ingrants, historical preservation, jurisdictional boundaries, and conservation and forestry management.

RESMs give a pictorial representation of the data contained in the cadastral records and summarize the land holdings. A RESM further illustrates the property lines of an activity, showing its metes and bounds, parcel acquisition data and outgrants and encumbrance data.

Computer graphic mapping systems are important tools to improve map production processes and support mapping requirements in a more cost effective manner. The Systems Analysis Division report on installing automated mapping for NAVFAC Planning and Real Estate is now under consideration for FY80. □

The process for better maintenance funding . . .

By REAR ADMIRAL ROBERT F. JORTBERG, CEC, USN

☐ Since 1974 the Navy has spent over $322 million to construct new naval hospitals and other medical care facilities but has been unable to adequately maintain either these new facilities or the older ones!

☐ During 1975 more money was spent to repair foreign object *damage to jet engines* at Naval Air Station, Miramar than was needed to overlay the spalling runway, *the source* of the foreign objects!

☐ In the spring of 1975 the Navy's resource allocation plan for fiscal years 1977-81 included the Program Objectives Memorandum (POM 77) to the Secretary of Defense that earmarked *only $10 million* per year *for major repair projects* for shore facilities throughout the entire Navy!

☐ The Navy's budget submission for FY76 for maintenance of real property *(MRP)* for those facilities maintained by the appropriation, Operations and Maintenance, Navy (O&MN), totaled only $254 million and the Secretary of Defense considered reducing this by $82 million during the budget review process!

☐ In July 1974 Pacific Fleet ships could not be refueled at Point Molate in San Francisco Bay as the fuel pier was so badly deteriorated that it was unsafe to bring ships alongside. Refueling was accomplished by barge. The design to repair the pier had been finished with a price tag of *$3.5 million*, however, the funds to accomplish this were not available. The FY76 budget of the Naval Material Command then being submitted included a total of *$2.6 million* for all major repair projects (projects to cost more than $25,000 each) for the entire command!

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The author retired 1 June 1979 from his post as Director, Shore Facilities Planning, Office of the Deputy Chief of Naval Operations (Logistics). He was relieved by Rear Admiral James T. Taylor, CEC, USN, who was recent commanding officer of Naval School, Civil Engineer Corps Officers (see page 17).

Admiral Jortberg, a graduate of the U.S. Naval Academy (1947), received the Legion of Merit in 1967 for his performance of duties as Southeast Asia Program Coordinator in Charge of Construction, Republic of Vietnam, in 1972 and later Commanding Officer, Western Division, Naval Facilities Engineering Command.

He was assigned to the post from which he recently retired in 1974 and was recognized for his innovative methods, one of which was the revision of funding processes for maintenance, the subject of this article.

Process for better maintenance funding ....

A DECADE of low maintenance funding leads to overall deterioration of many facilities as experienced by two air stations.

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These are startling facts but they are better understood by looking at what the Navy has spent for MRP recently. FY66 through FY76 is portrayed (Fig. 1) by using constant FY79 dollars to compare purchasing power over time. The area labeled "migration" represents the funds which were budgeted for some other purpose but which were actually spent for MRP. It may also be displayed (Fig. 2) as a percent of current (replacement) plant value (CPV).

This filters out changes in the size of the shore establishment as well as inflation. Both figures dramatically depict the rapid decline of MRP funding over the same 10 year period. A related analysis reveals that, for the total Navy, a minimum funding level of approximately 1.12% of CPV is required to meet the needs of day-to-day recurring maintenance without any reduction of the backlog. This may be considered to be a part of the cost of ownership. Locating this number on Figure 2 provides additional insight into the underfunding problem.

The conditions described above are illustrative of the facts that were surfaced as the maintenance of real property area was studied by the Shore Facilities Programming Division (OP-44), Office of the Chief of Naval Operations (OPNAV), in late 1974 and early 1975. As each of these facts was recognized, the same question—why?—demanded an answer.

An explanation was sought not only in OP-44 but also by the Office of the Secretary of Defense (OSD) and personally by Dr. James R. Schlesinger, then Secretary of Defense. Because each of the Services had addressed the OSD proposed cut in their MRP budgets for FY76 as a major budget issue, Dr. Schlesinger discussed the subject of MRP at an Armed Forces Policy Council meeting in January 1975.

A discussion is warranted on how the "why" was answered and how new procedures were implemented to provide decision makers of the resource allocation process with better information to make their MRP decisions.

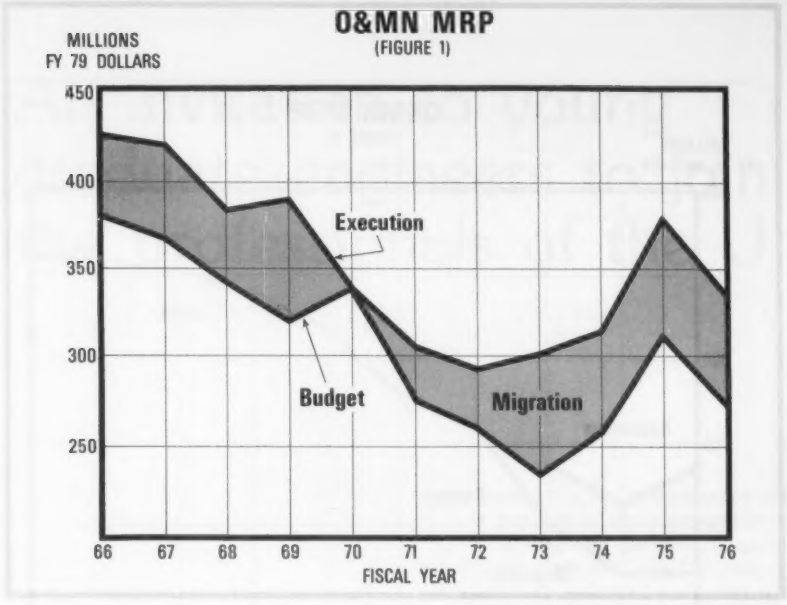
The search for the "why" also led to the programming phase of the Department of Defense Planning, Programming and Budgeting System. Any close study of resource allocation in the Navy quickly recognizes that the programming process is the fundamental process which determines the distribution of resources among the progam elements of the ten defense programs in the Five Year Defense Plan (FYDP).

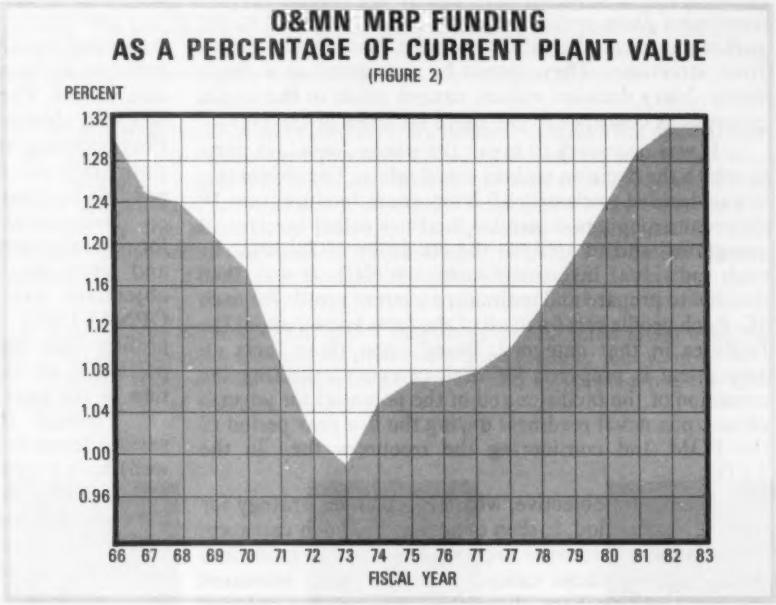
Each year the Chief of Naval Operations prepares a Program Objectives Memorandum (POM) for submission to the Secretary of Defense (SECDEF) which presents the Navy's plan for complying with SECDEF guidance and for the utilization of resources which SECDEF has indicated available for programming purposes. This discussion, of course, is not intended to be definitive with respect to the details of the POM process or the budget. A simplified explanation is that the programming process puts resources into the FYDP (which may be thought of as a bank) and the budgeting process takes the resources out and makes them available for use.

As simple as this relationship is, it has not been widely understood. Until recently, the programming process has been something of a mystery outside of OPNAV. By its nature it is an OPNAV process with little opportunity for direct input from major claimants. One result of this lack of understanding was that virtually all of the arguments which were developed in support of MRP resources were developed and presented in the budget process.

The Naval Facilities Engineering Command had for several years presented analyses which provided a convincing statement of the need for additional resources to arrest and reduce the growing backlog of maintenance and repair requirements. The problem has been that these requirements had not been considered during the programming process and very limited resources were identified in the FYDP (i.e., deposited in the bank) for MRP. In the absence of resources in the FYDP, there was virtually no chance of any increase during the budget process. To do so would mean a reduction in other programs which had been properly justified in the POM and properly entered into the FYDP.

What had happened was that the MRP requirements were being addressed in the budget but not in the POM. They were not being addressed in the fundamental resource allocation process.



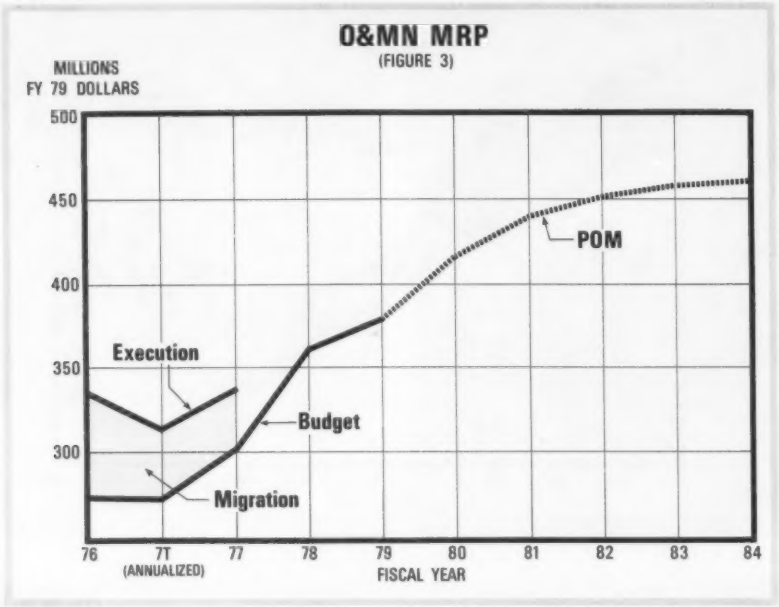


Recognizing the need to program MRP resources was easier than developing a technique for doing it. How could OP-44 convince the decision makers within OPNAV that more resources should be committed to MRP during the POM process at the expense of some other requirements?

In early 1975 there was in common use only one measure of the need for real property maintenance resources—the Backlog of Maintenance and Repair (BMAR). But this measure had little credibility. At the end of FY74, the Navy's BMAR in O&MN supported facilities was reported to be approximately $400 million—a number no one really believed. Surveys of the projects contained in the backlog by various groups (including the Office of Management and Budget and the Surveys and Investigations Staff of the House Appropriations Committee) raised serious questions as to the validity of the BMAR.

It was clear that an argument based upon a growing BMAR would not be persuasive. If the proposition were to be set forth that more resources were needed simply because the BMAR was $400 million, the logical response would be, "You are not telling me enough. How do I know that this level of backlog is bad for the Navy? What is its significance?" To seek increased resources in a highly competitive process, a better measure or statement of the requirement was needed.

The approach to new techniques for presenting these requirements recognized that the shore facilities of the Navy are highly diverse. They range from runways and



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parking aprons to hospitals, bachelor housing and waterfront structures. They cannot be considered as a single entity. Navy decision makers cannot relate to the single, amorphous concept of "the shore facilities of the Navy."

It was necessary to break the whole down into parts to which the decision makers could relate. To achieve this it was decided to classify all Navy shore facilities into 18 different groupings of similar facilities called investment categories, and to analyze the condition of facilities by each individual investment category (IC). It was then decided to prepare and maintain a current profile for each IC. Each profile sets forth all of the facts known about the facilities in that category. Based upon these facts an assessment is prepared for each category reflecting the condition of the facilities and of the potential for adverse effect upon naval readiness during the five year period of the POM and considering the resources then in the FYDP.

A program objective, which is a plan or strategy for the five year period, is then expressed for each category. The program objectives are long term trend guidelines which identify those categories which need increased emphasis and perhaps those that may receive reduced emphasis during the planning period. Finally, for each profile a macro estimate is prepared of the resources required over the five years to achieve the plan. The sum of the MRP resources required for all 18 investment categories is the total required for the Navy as a whole. (This concept has been implemented by OPNAV Instruction 11010.23D.)

Implementation has involved increased emphasis on the scheduled inspection of facilities at the activity level.

Without current information on the condition of facilities this approach would have no value. Each year Annual Inspection Summaries are submitted by shore activity commanding officers to their major claimants who analyze these inputs and provide CNO (OP-44) with an overall assessment of the condition of their facilities by investment category.

In OPNAV the assessments from all claimants are integrated into Navy wide assessments, and the need for revisions to the previously approved program objectives is determined. The Navywide assessments and the current program objectives are presented to the Shore Facilities Programming Board (membership includes all major claimants) in June of each year for discussion and possible revision.

Subsequent to the Board meeting recommendations for revised program objectives are presented to the CNO, and upon his personal approval, the new program objectives are published as a new enclosure to OPNAVINST 11010.23D. The analyses of the 18 profiles then become the principal inputs to the MRP portion of an annual Real Property Issue for consideration in the next POM analysis.

Through this approach the decision makers at various levels in OPNAV (and at the major claimants as well) have a structured analysis of the condition of Navy real property, the potential for impact on readiness and the resources required to achieve the approved five year MRP plan. Their decisions can then be based upon an understanding of their long range implications.

This process is now in its third cycle, and it has gained understanding and acceptance within the Navy and is recognized as a meaningful approach by the OSD staff. The results of this approach since FY76 are shown (Fig. 3). In constant FY79 dollars, MRP budgets have grown from $274 million in FY76 to $378 million in FY79. This represents a growth from .95% of CPV to 1.31% and is a 38% real program growth.

Even more encouraging, the OPNAV decision makers increased the MRP levels in the "bank" during POM '80, with $447 million for FY80 in the President's Budget now before Congress. With this increase, the MRP level in FY80 jumps to 1.40% of CPV. Substantial progress has consequently been made toward eliminating the large backlog of maintenance and repair needs caused by the previous decade's low funding levels, and most important, the potential threat that the condition of shore facilities would constrain Navy military readiness has been minimized. □

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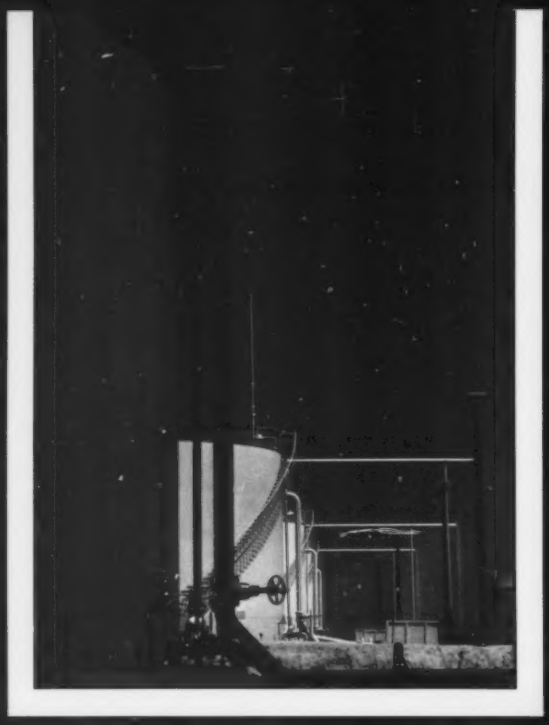

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